

**Forbidden Fusion Deutsche Börse / NYSE
Euronext**

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Forbidden Fusion

An analysis of the Deutsche Börse/NYSE
Euronext Merger

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Chapter 1: Introduction

1.1 Introduction

In 2011 a merger was planned between NYSE Euronext and Deutsche Börse which are the two market leaders on the European derivative market. Both players act in a market where mergers are a current trend. Either, the European Commission has different statements about exchange mergers. Merger developments in this industry are particularly interesting to analyze, because these horizontal mergers are different from other horizontal competition mergers (for example, horizontal airline mergers). Monopolistic mergers with an incentive to raise prices are normally blocked by the European Commission, but an exchange merger is mostly based on liquidity incentives. Liquidity on an exchange has a significant impact on behavior of derivative traders because it provides derivative traders¹ a compensation for the threat of higher transaction fees. With these altered merger cases the European Commission has different statements. For example, the European merger between NYSE and Euronext is approved by the European Commission while the merger between Deutsche Börse and NYSE Euronext is not approved by the European Commission. The decision of the European Commission is mainly based on the consumer and entrant perspective. In addition, liquidity is a very important variable that affects the derivative trader and entrant perspective after an exchange merger. Therefore, it is very interesting to investigate the financial market and liquidity. The merger of Deutsche Börse and NYSE Euronext, both brought forth to the court in June 2011, was prohibited. What made the decision of the European Commission to prohibit this case? The European Commission seems to have a fair approach to investigate the DB/NYSE merger, but do they take all important variables in this financial market into account? The European Commission, who considered protection of entrants and derivative traders as most important aspect, might have a too narrow view on blocking the DB/NYSE merger. This thesis focuses on the DB/NYSE merger and formulates a conclusion which takes more variables into account than the European Commission did. This thesis investigates what role exchange mergers

¹ Derivative traders (R.E. Bailey, 2005):

1. *Public derivative traders*, who ultimately own the assets and who are motivated by the returns from holding the assets. Public investors include private individuals, trusts, pension funds and other institutions that are not part of the market mechanism itself.
2. *Brokers*, who act as agents for public investors and who are motivated by the remuneration received (typically in the form of commission fees) for the services they provide. Under this interpretation, brokers trade for others, not on their own account.
3. *Dealers*, who do trade on their own accounts but whose primary motive is to profit from trading – rather than from holding – assets. Typically, dealers obtain their return from the difference between the prices at which they buy and sell the asset over short intervals of time.

have in the financial market. Which effects do exchange mergers, like DB/NYSE, have on new entrants and derivative traders? Here, liquidity after and before an exchange merger is an essential subject which can explain the behavior of merged exchanges, derivative traders and new entrants. The reasoning and theory behind this thesis can be applied to other (future) cases.

In the last ten years the relevance of managing risk and uncertainty increased. Managing risk and uncertainty could now be more efficient and in bigger markets. Therefore, international competitors like NASDAQ, NYSE, Deutsche Börse and others, have a high influence on the global economy. Players on these markets have an important effect on facilitating trading of derivatives, currencies, interest rates, default risk, stocks and bonds. By facilitating tradable financial contracts, the exchange has sufficient influence on behavior of derivative traders. In a rising economy this financial market accelerates worldwide economic development. Exchanges provide liquidity in which derivative traders can manage their risk. Either, in a downward spiraling economy products traded in this market gave us nothing but trouble (Matthews and Thompson, 2008).

1.2 Thesis structure

An overview of the financial market where in Deutsch Börse/NYSE Euronext act will be provided, followed by an examination of the standard considerations (unilateral effects and efficiency gains), then the content of liquidity will be explained, followed by an analysis of the effects of liquidity on exchanges and derivative traders, then an analysis of the submitted remedies DB/NYSE proposed to the European Commission will be provided and at last a conclusion will be formed about the effects of the DB/NYSE merger on new entrants and derivative traders.

Chapter 2: The Case

2.1 The Case

In this chapter, the European Commission's² decision, with regard to the Deutsche Börse/ NYSE Euronext³, will be put forth in concise framework with emphasis on the economically relevant facts. NYSE was formed in 2007 and operates on numerous exchanges in European capitals. The firm has four main businesses in US and Europe: (1) cash listing services⁴, (2) cash trading services⁵, (3) trading derivatives, (4) information services and technology solutions⁶. DB is a German listed exchange which offers identical products and services in European derivative market as NYSE. With overlapping services, DB and NYSE are direct competitors in the European exchange market. Considering the competitive market both firms constantly seek for new innovative products and services. Derivatives are by far the most interesting market instruments in which both firms can choose the best competitive outcome. However, on June 2011 DB and NYSE, respectively acting in Europe under the names "Frankfurt Stock Exchange" and "NYSE Liffe", announced a merger between NYSE and DB into an Amsterdam-based parent company "Hold Co". DB will hold approximately 60% of the shares and NYSE approximately 40%. By approval, the merger DB/NYSE would have dominant position on all four main businesses of the European exchanges. The European Commission decided to analyze this post-merger on all main businesses. In 2012 the EC concluded that DB/NYSE couldn't get an approval, because the merger results in a monopoly in the third main business: derivatives.

DB and NYSE both earn profit by acting as a financial intermediary where derivative traders can settle their contracts. Both companies are highly competitive and differentiate themselves by providing liquidity, low transaction fees and advanced technology systems. The most important manner in which exchanges attract new derivatives traders is providing liquidity. The exchange that offers the highest liquidity is able to make the most profit. Both exchanges facilitate similar derivative contracts which are highly substitutable. Therefore, the EC found that DB and NYSE form a competitive constraint on each other and that their pricing behavior dependent on one another's

² From now on abbreviated to EC.

³ From now on abbreviated to DB/NYSE.

⁴ Cash listing services: The exchange of cash securities listed at the Deutsche Börse or NYSE Euronext. Cash securities are meant provide financial funds for companies or government authorities (Case Deutsche Börse / NYSE Euronext, 2012).

⁵ Cash trading services: Provision of trading services for all main categories of cash instruments.

⁶ All exchanges always provide highest service and technology as possible. This is necessary to keep the trading volume in check.

actions. The EC stated that there is less buyer power (higher transaction costs) and low threat of entry (entry costs and risks would be significant) in the European financial market, because of the current merger activity. DB/NYSE denies that the merger would alter threat of entry, claiming that its customer awareness, reputation and market share would not affect the decision of a potential entrant. The EC argued that DB/NYSE would have an unbreakable established position on European market. The EC stated that DB and NYSE underestimate the effects of liquidity (which is very difficult to obtain for new entrants). In addition, a merger would lead to incentives of higher transaction fees and less innovation incentives. This is detrimental for the European economy, because higher transaction fees and less innovative derivatives constrain the market size.

2.2 Remedies

DB/NYSE proposed several remedies⁷; a structural remedy and a behavioral remedy. The structural remedy contains divestments in single stock derivative contracts. This raises the question whether this provides actual opportunities on the market for new entrants. Divestments in these kind of derivatives are a small part of the total amount of derivatives on exchanges. The behavioral remedy contains an opportunity for new entrants to have a one-year advantage with new innovative derivative contracts. The EC found that these remedies were insufficient and found that none of the remedies would appropriately stimulate competition. In the end, the EC and courts concluded that the supposed efficiency gains could not outweigh the welfare loss from decreased competition that would have developed after the DB/NYSE merger.

⁷ Source: Case Deutsche Börse / NYSE Euronext, 2012.

Chapter 3: Overview

In this chapter an overview of some important elements in the financial derivative market will come forth⁸. The purpose of this financial market consists of facilitating the exchange of derivatives. The existence of these financial markets resulted in an increase of global economic development. Exchanges can provide multiple functions⁹ in which participants could exchange their asset in many financial contracts. The market of derivatives, which includes equity-, stock- or interest-derivatives, will be investigated. Derivatives are products emerging from allocating risk¹⁰. On the exchange of DB and NYSE for example, underlying assets are 'implicitly' exchanged in order to reduce risk of devaluated assets or appreciated liabilities. Note that these derivatives are direct and implicitly made on the exchange of DB or NYSE, which implies that there is a commitment to settle future changes in value. The underlying asset could itself be a derivative or could be standard assets (e.g., cash).

Generally, derivatives are traded in two types of contracts; Forward agreements and options. Forward agreements are contracts in which buyer and sellers agree to execute an action at an agreed location and date in the future. *Futures* are forward agreements, where a commitment is made to settle future changes in value of assets. It is necessary to distinguish between the promise to deliver (forward contract) and whatever underlying asset it is that has to be delivered in the future. The underlying asset can be explained as anything with sufficient value varying from shares in a company, to cash, to physical assets. The next forward agreements are *swap futures*. Swap futures differ from normal futures in that they specifically deal with movements in international interest rates. Swap futures are financial contracts that allow buyer and seller to exchange their future cash flows to each other, where one party implicitly pays a variable interest rate and the other party a fixed interest rate. Buyers and sellers base their decisions on the expectations of the behavior of interest rates. By participating in future contracts derivative traders use all kinds of underlying asset, but dealers have a more specific asset to participate in these contracts. Dealers use short-term repurchase-lending from the government in order to participate in derivative contracts. These lending from the government have a minimal interest rate and will be paid back within a day. *Options* are second type of contracts that are exchanged. The owner of options is not obliged to buy or to sell an underlying asset. Unlike future contracts where the owner immediately must find another party if the

⁸ The theory in chapter 3 is supported by "The Economics of Financial Markets" by R.E. Bailey (2005).

⁹ 1: Clearing and settlement of payments, 2: Pooling resources and subdividing shares, 3: Transferring resources across time and space, 4: Risk diversification, 5: Providing or hiding information, 6: Optimize incentive problems (Bailey, 2005).

¹⁰ Allocating risk from uncertainty for changes in value of assets.

contract defaults, options have the opportunity to expire if another party is defaults. Furthermore, options can be distinguished between call and put options. In call options owners (buyers) have bought the right to buy an amount of underlying asset at a specific price. The writer (seller) of the contract is obliged to participate in the contract for the owners predetermined price. The writer gets a premium from to new owner of the option. The owner speculates on the appreciation of the call option. In put options owners (sellers) have bought the right to sell their amount of options at a predetermined price. A writer (buyers) is obliged to participate in the contract for his predetermined price. The writer gets a premium from the new owner of the option that speculates on depreciation of underlying assets.

These market instruments fulfill two purposes on the market. The first purpose of derivative traders on an exchange market is hedging and risk management. Derivative traders on the exchange are willing to insure themselves to reduce uncertainty/devaluation of their assets or uncertainty/appreciation of their liabilities. Typical examples of hedgers or risk managers that enter the exchange are farmers, companies with shares and other companies with a lot of assets. Large numbers of hedgers and risk managers each holding different preferences (influenced by uncertainty) and amount of asset. Preferences and underlying asset determine how they maximize their profits at certain bid-ask spreads. The second purposes to participate in derivatives are investment decisions. Dealers are acting on the floor of exchange aiming at profits by trading at a favorable bid-ask spread. Dealers fulfill a speculative role and an arbitrage role in the market. The nature of dealers is to seek profit by trading according to their expectations about the future. They will bear the risk that that their expectations may turn out to be wrong. In addition, dealers use a repurchase lending from the government in order to execute contracts on the exchange. Due to this mechanism, dealers also have an arbitrage role because they profit from the difference between minimal interest rate payable and profits resulting from derivative contracts. Brokers also act on exchange floor, but they will only trade on behalf of others. Dealers and brokers are acting in so called quote-driven markets where they 'quote' their bid and ask prices. Due to the activities of dealers and brokers, settlement of financial contracts increases on the exchanges.

Important to note is that derivatives are traded in two markets. The first market where derivatives can be traded is obviously on exchanges¹¹. In ETD-markets small standard financial contracts are traded right away, because underlying assets, date, size, legal conditions, etc. are already determined. This implies that other traders in the market can observe fluctuations and flow settled of contracts. The second market where derivatives

¹¹ From now on abbreviated as ETD-Market.

can be traded, which is much larger than the ETD-market, is the over-the-counter market¹². The financial contracts in this market are larger and are allowed to customize its specifications (underlying assets, date, size, legal conditions). OTC-market derivatives arise from bilateral negotiations¹³ where the specified contract is reported to the exchange. Two examples of 'pure' OTC-market derivatives are interest rate swaps and credit default swaps. In the OTC-market dealers and different kinds of electronic platforms are able to increase settlement of OTC-market contracts. In the OTC-market there are electronic platforms which facilitate derivatives between dealers and public derivative traders. These platforms serve as an intermediary before the contract is reported to the exchange. In general, the OTC-market is more profitable than the ETD-market. The OTC-market accounts for 90% of the overall derivative activity in Europe.

¹² From now on abbreviated as OTC-market.

¹³ Bilateral negotiations: No outside participants can observe the contract.

Chapter 4: Standard considerations

4.1 Introduction

In this chapter the standard considerations of a horizontal merger will be applied to the DB/NYSE merger. The standard considerations consist of an analysis of unilateral effects¹⁴ and efficiency gains of the DB/NSYE merger. Note that the liquidity effects in this chapter are not taken into account. By investigating the standard considerations a conclusion can be made about the opportunities for new entrants and derivatives traders after the DB/NYSE merger. This chapter will analyze how unilateral effects affect possibilities of potential competitors and derivative traders and how DB/NYSE benefits from efficiency gains. The unilateral effects will indicate the opportunities for new entrants after the merger. The analysis of the efficiency gains indicates whether DB/NYSE benefit after the merger. In addition to the unilateral effects an analysis of the behavior of transaction fees in a competitive and monopolistic market is given. After this analysis it should be noticeable which market derivative traders and/or exchanges prefer. Efficiency gains could also have a supportive role in analyzing the behavior of transaction fees.

Part one: Unilateral effects

4.2 Higher market share DB/NYSE

In this section the relation between DB/NYSE and potential competitors in the European exchange market will be investigated. A higher market share in a financial derivative market lead to various benefits for the merged parties. Often, these benefits are detrimental for potential competitors. Normally, a higher market share leads to changes in transaction fees on an exchange. Therefore, the behavior of transaction fees after an exchange merger will also be explained.

Before the merger, DB and NYSE are highly competitive and both eager to provide highest liquidity on their exchange. After the merger DB/NYSE would be able to provide higher liquidity in the derivative market. Higher liquidity offers smaller bid-ask spreads, larger market depth¹⁵ and stable market prices along with higher transaction fees (higher fees that derivative traders are willing to accept). With an increasing derivative base and

¹⁴ Unilateral effects are post-merger results where the merged firm finds it profitable to raise price on the market due to the removal of competitive constrains. If the two merging firms produce a highly substitutive service, the greater the unilateral effect will be and hence the greater the price increase. In the rest of this chapter, the specific DB/NYSE merger case with relation to potential entrants will be further discussed and will include; switching cost of consumers in Europe and specific barriers to entry on the market (Motta, 2004).

¹⁵ The definition of market depth will be provided in chapter 5.

liquidity, cross-margin possibilities will improve too. Cross-margin effects ¹⁶(Case Deutsche Börse / NYSE Euronext, 2012) account for reducing systemic risk in the market by covering derivative below margin with excess margin derivatives. With an increasing derivative base and increase in liquidity, an improvement in cross-margin opportunities will strengthen the position of merged exchanges even more. Therefore, DB/NYSE will keep their derivative portfolios as correlated as possible because derivative traders always aim for best hedging and cross-margin opportunities. Furthermore, both exchanges capture market share with providing high service, higher switching costs, lower transaction fees and a highly correlated derivative base. New entrants, who want to establish themselves on the European derivative market face high entry cost, are lacking in liquidity (and thus, lacking in cross-margin possibilities). The established position and actions of the merged parties will deter the improvement of quality and quantity of entrant's derivative portfolios. In chapter 4.3 the possible threat of entry after the exchange merger DB/NYSE will be further explained.

4.2.1 Introduction transaction fees

In this part behavior of transaction fees after merged exchanges will be explained. In the first part definitions of different kinds of transaction fees will come forward. An additional overview of transaction cost in ETD-markets and OTC-markets will also be exposed. In the second part a two-period model will explain the behavior of transaction costs. Eventually, behavior of transaction costs in monopoly and competition could be explained. It should be noticeable which market form derivative traders and/or exchanges prefer.

4.2.2 Definitions

By participating in the derivative market, every trader is involved with certain costs. Most cost of derivative traders are incurred by exchanges. Exchanges are able to lower transaction fees by diversification of financial contracts. In general, derivative traders have less cost by trading derivatives on an exchange. This raises the question whether transaction fees behave more favorable for traders in a monopolistic or competitive market.

¹⁶ Cross-margin effects: Reducing systemic risk in the market by covering derivative below margin with excess margin derivatives. This effect more likely reduces systemic risk in the market. This effect occurs if two competitors merge (Increasing liquidity and increasing derivative base).

The exchange fees can be differentiated between a fixed part and a variable part (Bailey, 2005)¹⁷.

Fixed transaction fees

Membership fee: Periodic payments for derivative traders who use trading and clearing services of the exchange. Every trader from the ETD-market or OTC-market, who wants to trade, pays a fixed membership fee. These periodic fees are activated when a trader submits himself on the exchange.

Posting fee: Payments for derivative traders who register their assets as collateral for trading and clearing derivatives on the exchange. These costs can also be seen as verification costs. Every derivative trader submits a certain amount of underlying asset to the exchange in order to participate in contracts. For processing and verification of the underlying assets exchanges receive a fixed payment of the derivative trader.

Variable transaction fees

Trading fee: Payments that occur on an exchange when a derivative contract is executed. This fee affects all derivative users that trade in the ETC-market. This implies that all derivatives listed on the exchange are involved with trading fees. Once a forward agreement or option is executed, seller and buyer pay a variable amount of commission to the exchange. An exchange always benefits if trading volume increases. Note that derivative contracts first made on the OTC-market don't suffer from trading cost. After introduction to the exchange, contracts become 'listed' on the exchange. When a derivative trader defaults¹⁸ in the OTC-contract, the upcoming participants in this contract pay a trade fee.

Clearing fee: Payments that occur when a contract defaults. Traders that participate in listed contracts on the exchange and contracts in the OTC-market, pay clearing fees if a contract defaults. Clearing houses give the assurance that it will cover defaulted contracts for an agreed amount and time. Traders of defaulted future contracts are willing to remain active in the market which has positive outcomes for liquidity on the exchange. OTC-contracts in particular, must first have been introduced and executed on the exchange in order to use the service of clearing houses¹⁹. Note that clearing fees are meant to cover margin costs of defaulted contracts. Clearing houses play an important role for stabilizing bid-ask spreads on an exchange.

¹⁷ In addition, "Global Custody and Clearing Services" by O. McGill and N. Patel (2008), provides a similar definition of transaction fees. The majority of transaction fees have a variable nature.

¹⁸ Contract default: One party in the derivative contract decides to leave before the agreed time to exchange underlying assets.

¹⁹ Note that clearing houses aren't independent entities in the financial market. They are part of an exchange.

In financial contracts buyers and sellers match, bilateral or multilateral, by finding an opposite party (Bailey, 2005). Bilateral trading is done in OTC-markets where no third party can observe the trading. Third parties can only observe the bid-ask spread when the OTC-contract is already reported to the exchange. Especially in new emerging markets it is very interesting to analyze behavior of bid-ask spreads of OTC-derivatives that are exchanged upon these markets. In multilateral trading, derivatives are executed on ETD-markets where every trader is able to observe the bid-ask spread, size of standardized deals and trading volume. After participating in many contracts in a day, traders are influenced by different variables. The realized bid-ask spread, opportunity cost of posting collateral, liquidity and transaction fees determine the return of traders. When a trader defaults early in the contract, clearing houses act temporarily as buyers or sellers. Again, exchanges provide an opportunity for derivative traders to remain active in the market. By providing this service, exchanges cover themselves against risk and liquidity problems. Clearing houses of exchanges have a pool of default funds which is covered by clearing fees. Shifts in clearing fees may occur if clearing funds can't cover minimal margin cost of defaulted contracts. After securing the risk of defaulted contracts ETC-derivatives or former OTC-derivatives are listed at the exchange as *open interest*.

4.2.3 Transaction fee model

After describing the market in short, a demonstration of a simple two-period model can explain behavior of transaction fees in a competitive and a monopolistic market (Matthews & Thompson, 2008)²⁰. In absence of the exchange, the costs that occur when trading derivatives would be higher than if there was an exchange. Again, exchanges are able to offer lower transaction fees because they can diversify in derivatives. In absence of the exchange, the cost/return structure of buying or selling derivatives in period one or two, denoting the amount of return as R , the various cost²¹ incurred by the borrowers as C_b and those incurred by the savers as C_s . In the model C is negative for the saver and positive for the borrowers. In addition, variable R must be further explained. The R represents return for borrowers and savers of financial contracts. The return R of borrowers and savers depends on the various variables in the market. Due to asymmetric information, defaults and liquidity (which is mainly explained by bid-ask spreads), differences in return of saver (R_s) and return of the borrower (R_b) occur. In this model the role of transaction costs on the perspective of the borrowers and savers will be analyzed. The main focus is that transaction costs gives increasing opportunities for borrowers and savers. The borrowers and/or savers expect to make a profit by

²⁰ The actual source of this model comes from "A Transactions Cost Approach to the Theory of Financial Intermediation" by G.J. Benson and C.W. Smith (1976).

²¹ Various costs stands for every cost, besides transaction fees, derivative traders are involved with when participating in a contract.

participating in financial contract. Considering underlying assets both parties can reach a maximal outcome in derivative contracts. For the sake of behavior of transactions costs, R is explained as the return in derivatives of borrowers and savers in period one or two. The spread represents the difference in return by saving underlying assets in period 1 (to invest in period 2) and borrowing underlying asset from period 2 (to invest in period 1). *Again, savers and borrowers in this model could be explained as buyers and sellers. Buyers and sellers of derivative contracts who consider whether it is more profitable to invest in period 1 or 2.*

The return to the saver $(R_s) = R_s - C_s$

The return to the borrower $(R_b) = R_b + C_b$

The return $R_s - R_b = C_b + C_s$

The current spread provides an opportunity for an exchange by introduction of transaction fee(s) F.

The return to the saver $(R_s) = R_s - C'_s + F(\text{membership, trading, clearing})$

The return to the borrower $(R_b) = R_b + C'_b + F(\text{membership, trading, clearing})$

The return $R_s - R_b = C'_b + C'_s + F$

The implementation of transaction fees will lower the various cost of the financial contracts. Due to lower transaction fees buyers and sellers are able to participate more effectively in derivative contracts. The various cost C' and transaction fee(s) F , together, must be lower than the various cost C . The introduction of an exchange will lower the various costs ($C > C'$). If those various cost C' fall more than the amount of transaction fees charged by the exchange savers and borrowers will trade in more derivatives. This conclusion will be shown by a condition below.

$$(C_b + C_s) - (C'_b + C'_s) > F$$

This conclusion can also be illustrated by using a graph²² for the two-period analysis. The initial endowment, given as Z , provides underlying asset for Y_1 and Y_2 in period 1 and 2. The line CD is based on the assumption that there are no transaction fees. For example, a saver in a derivative contract will provide less underlying asset Y_1 in period 1 so that his equilibrium position will be along CD the left of Z , for the borrower the equilibrium will be to the right of Z on the line CD . The altered lines B and S represent the investment opportunities of savers and borrowers if both various costs C and variable

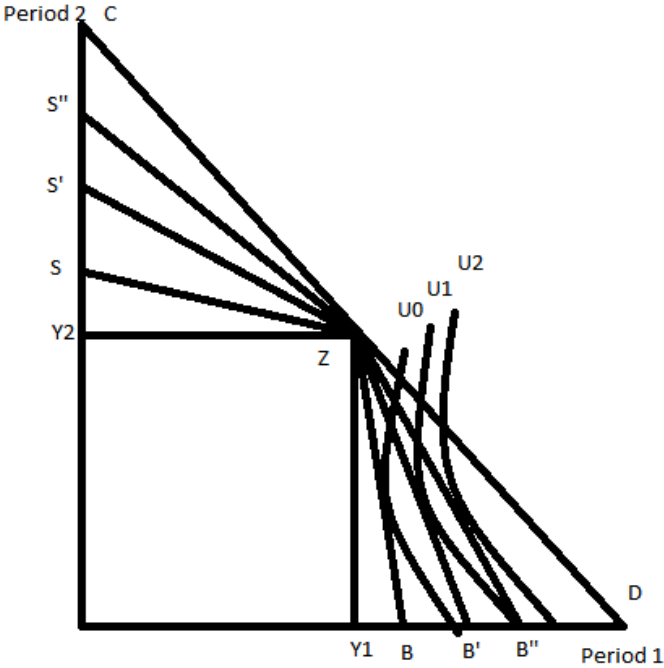
²² The graph is shown on page 17.

transaction fees F are present. The shape of the line BS depends on the changes in various costs C and variable transaction fees F . If there are no exchanges, the line B and S will occur. From there on the line B and S will rotate less inwards if exchanges enter the market. Transaction fees have a major influence on the possibilities of underlying asset. From initial endowment Z the shape rotates inwards to B and S (borrower $-(1+R-C_b)$, saver $-(1+R-C_s)$). By introducing an exchange with transaction fees (F), various costs of borrowers and savers become lower (C 's and C 'b). Most of these costs C are eliminated because the exchange is able to provide overlapping service in a more effective way. Therefore, various costs C decrease when there is an exchange in the market. Furthermore, from the initial endowment Z the shape of the line rotates less inwards (B' and S') if there is an exchange. From initial endowment Z the shape of line rotates less inwards to B' and S' borrower $-(1+R-C'b-F)$, saver $-(1+R-C's - F)$. The gap between the two kinked lines B/S and B'/S' can be explained as $(C_b+C_s) - (C'b + C's + F)$. This results in a higher level of utility (U_1) for borrowers and savers of derivatives. Lowering costs for borrowers and savers is possible because established exchanges have advanced IT systems, known locations, standardized contracts and risk assurances. In the European market DB and NYSE are main competitors which have a declining effect on transaction fees. This implies that the shape of the curve rotates another time less inwards to B'' and S'' . In the practice this effect is ambiguous because derivative traders deal with sufficient switching cost. Due to switching costs (for example, membership fees) the net effect of lowering transaction fees can't be determined with certainty.

The conclusion in this model is that transaction fees are lower if competition in the market becomes higher. Exchanges benefit from having more trading of derivatives on their exchange. Offering a low transaction fee will benefit the exchanges themselves, but also benefits derivative traders. Lowering transaction fees will give derivative traders an opportunity to invest their underlying asset more effectively. In contrast, a monopoly will lead in this model to higher transaction fee and less investment opportunities for derivative traders. Exchanges have more market power in which they can raise their prices.

In addition to this model, transaction fees are positively related to liquidity. If the liquidity on the exchange rises, transaction fees also tend to rise. Liquidity is the main mechanism that attracts derivative traders. Fluctuations in transaction fees will react positively to changes in liquidity. Exchanges must decide in how far exchanges must raise their transaction fees if liquidity increases. Competitive exchanges try to attract as many traders as possible in order to increase/stabilize liquidity. This is achieved by lowering transaction fees (O'Hara, 1995). A monopolist in contrast, must be careful with setting transaction fees. A monopolist must make a decision when to alter the rising

transaction fees if liquidity increases (alter the positive ratio between liquidity and transaction fees). If the transaction costs are too high, liquidity can't be optimal. In chapter 5 developments in liquidity on exchanges are further explained. The analysis will explain also how exchanges transaction fees and liquidity are related.



4.3 Threat of entry

In this section the possible threat of entry after the DB/NYSE merger will be analyzed. The statements of the EC are taken into account for the analysis.

The DB/NYSE merger would change exchange industry in Europe significantly. The merged firm would capture 90 percent of the derivative market share (and have a similar dominant position on the other three exchange functions) which would result in increased market power. An increase in market share of this scale would lead, according to EC, to rising transaction fees. The ability to raise prices and improve liquidity could potentially be constrained by the threat of potential entrants in all sorts of derivatives. Established and new exchanges have an important function in the European economy, but new exchanges have difficulties to establish themselves on the market. A new exchange that wants to enter the market has to deal with high sunk costs, time to build a reputation and possibility constraints (incapable in providing similar liquidity).

In addition, new firms that adapt an innovative approach will have to compete fiercely with DB/NYSE. DB/NYSE has an incentive to raise transaction fees, because their market power will increase. For new entrants the merger can have a positive outcome (without

liquidity taken into account), because they can set lower transaction fees than DB/NYSE. (Motta, 2004). Then, by setting transaction fees beneath the transaction fees of DB/NYSE, new entrants are able attract derivative traders. Still, only a highly competitive entrant, that offers similar substitutable derivatives as DB/NYSE, will take the risk of entering this market. New entrants also have higher costs which forces them to earn their initial investment back as soon as possible. Without taking liquidity into account, a merger can give new entrants an incentive to set lower transaction fees than DB/NYSE. Either, this analysis is not sufficient because it can't be assumed that transaction fees increase after the merger. Behaviour of transaction fees depend on liquidity and deserve a more specific analysis which will be provided in chapter 5. Furthermore, the threat of entry after the merger deserves also a more specific analysis which is supported by the statements of the EC.

For an estimation of the level of competition after the merger, the EC focused on possible competition of DB/NYSE in Europe. The main part of exchange activities of both exchanges is located in main cities of Europe (London, Amsterdam, Paris, Frankfurt, etc.). As said, it is very unlikely for new entrants to establish themselves in one of these cities with similar derivatives. New entrants in main cities must offer similar liquidity and lower transaction fees in order to obtain market share. Due to the market power of DB/NYSE these criteria will be unreachable for entrants. In a less exchange occupied city there are more opportunities for new entrants, because it is still possible for new entrants to capture a market share with new local products²³. It is important that these derivatives are specified to the commercial activities in the local area. As soon as these new local derivatives are brought to the exchange in main cities, new entrants losing market share again. Therefore, new entrants should establish themselves in the less exchange occupied cities if new derivative markets emerge.

New entrants can position themselves in the exchange market if they are willing to change their worldwide view towards a more local view. Entrants can position themselves in the 'niche' of derivative market. For example (Case Deutsche Börse / NYSE Euronext, 2012), ICE (new exchange) captured a decent market share in credit default swap derivatives within the energy market. Generally, a market where a sudden economical growth arises, (new) derivatives will follow this economic growth. This is why entrants always have a chance to enter the market, but always constrained by the lack in providing liquidity. This will deter new entrants from growing in the market.

4.4 Predation

The following arguments explain that barriers can be created by aggressive behaviour of DB/NYSE. Especially in emerging markets, DB/NYSE makes it difficult for the potential

²³ Source: Case Deutsche Börse / NYSE Euronext, 2012.

entrant to serve the market. In the situation when DB/NYSE is aware of outside competitors, considering emergence of new market with innovative derivatives, DB/NYSE might act aggressively to eliminate these routes for entrants. By providing these products themselves and using exceptionally low fees (at start-up of new derivative contracts), DB/NYSE is able to stay ahead of competitors. This behaviour is positive for derivative traders, but confirms a negative constraint on new entrants (Motta, 2004).

Thus, new entrants who wish to create their home base in a main city in Europe lose all those incentives when they consider the market power DB/NYSE has. Therefore, it seems that new entrants will never reach full market penetration in Europe. New innovative products will disappear by aggressive/duplication behaviour of DB/NYSE. New entrants only can obtain a minimal position in the market if DB/NYSE is willing to divest in some of its assets. This will be analyzed in the chapter of merger remedies.

4.5 Further barriers to entry

The DB/NYSE merger creates additional barriers to entry in a few ways.

First, the membership base of DB/NYSE could constrain opportunities for new entrants. DB and NYSE both made necessary investments that led to solid trader awareness. New derivative traders benefit from the wide connection network and liquidity of DB and NYSE. Joining this exchange gives them the best opportunity for maximal connection with other traders. The facilitation of multiple distribution bases of DB/NYSE and maximal connection of traders is a high barrier for new entrants.

Second, several exchanges of DB/NYSE will have profits due to economies of scale (chapter 4.7), in the form of IT-savings reputation with derivative traders that would be difficult to compete with. A new entrant must have many accessories in order to adapt to shifts in market demand. For the potential entrant to form a competitive restraint on DB/NYSE, it would have to be based in main cities of Europe. The entrants could establish a low-cost structure which would include large initial investments (Motta, 2004). Due to the market power of DB/NYSE, it would be nearly impossible for a new entrant to successfully enter the market.

Third, intellectual property rights²⁴ are another barrier for new entrants. Besides the previous discussed barriers, new entrants are also deterred by property rights of equity and interest derivatives of established incumbents. In the first place intellectual property reduces the amount of potential participant's on the whole European market. The required licence for certain derivatives reduces the amount of competition and innovation for DB and NYSE. Secondly, new entrants are forced to innovate because they can't

²⁴ Source: Case Deutsche Börse / NYSE Euronext, 2012.

compete in existing derivatives. A big part of the innovative products are, so called, imitator products²⁵. These products have the same outline as existing derivatives on big exchanges, but in practice these products bring not nearly the success as original derivatives do. In general, derivative traders are sceptical about new derivatives which draws them even more to established exchanges.

Part two: Efficiency gains

4.6 Efficiency gains brought forth in court

Even though DB/NYSE argued that the merger would lead to significant efficiency gains, the EC did not approve the merger. There are several reasons why a merger could lead to a more efficient organization. In this section, the efficiency gains brought forward by DB/NYSE and statements of EC will be discussed in greater detail²⁶.

Economies of scale are likely to arise in the exchanges for several reasons. First, duplication of certain fixed costs will be eliminated. Because all exchange companies operate on their own platforms, a merger would lead to the existence of only one platform. This, in combination with the increase in clearing and trading derivatives, would result in lower IT and access costs. All fixed IT and user access costs will be relatively lower by increase in tradable derivatives in one European platform. Second, the best IT staff is allowed to operate on their own facilities at the exchange. The merger would create one European exchange that is able to arrange activities as efficiently as possible and provide derivative traders with a higher quality service. When the right employees are positioned as effective as possible, DB/NYSE is able to reduce fixed and variable cost (salary). When the two exchanges merge, there is a higher chance for delivering high quality services for derivative traders. These two suggestions in economies of scale could result in higher profit margin by trading and clearing derivatives on the DB/NYSE exchanges. Decreasing the amount of fee for trading exchanges and clearing houses would profit from higher liquidity of derivatives and therefore has positive effects on the economy as a whole.

However, the EC questioned the credibility of the effects of economies of scale for DB/NYSE. The EC stated that it will be difficult to estimate IT- and user access cost savings precisely, because consolidation of the two exchanges are big and difficult to observe. It is only possible to gather 'rough' data from IT- and user access costs after the merger and therefore hard to prove that economies of scale have identifiable positive effects on the margin between profits and cost. In addition, fixed and variable transaction

²⁵ Imitator derivatives usually follow the popular trend. If interest rate derivatives of established exchanges are popular at that moment, new entrants will try to design similar derivatives. However, the actual benefits for new entrants from these derivatives can be neglected.

²⁶ Source of efficiency gains brought forth in court is Case Deutsche Börse / NYSE Euronext, 2012.

fees will be higher if there is a monopoly on the European exchange market. After the merger the competition will be minimal and this fact will not contribute to the idea that an economies of scale lowers the fixed and variable transaction fees. Furthermore, economies of scale do have positive effects on the liquidity of European derivatives, but it's difficult to prove that cost-effectiveness have positive effects on the fees for trading and clearing derivatives.

Either, the reactions from EC on economies of scale of DB/NYSE aren't convincing. Related to economies of scale is bargaining power. With increasing bargaining power DB/NYSE is able to exercise more (price) influence on derivative traders. Normally, a merged company with a larger market share to able to set higher fees and access costs. Derivative traders who seek access to the exchange will be confronted and threatened after a merger, but nowadays 90% of the total derivative activity consists out of OTC-derivatives. These contracts can be made anywhere on the international exchange market. By a too large confrontation/threat in price or service on the European exchanges, it is relatively easy settling OTC-contracts overseas. This is an important gap in the bargaining power after an exchange merger. It is not wise to raise fees after the merger. Therefore, it is important to improve service and keep prices in check.

Exchanges differentiate themselves by offering lowest transaction fee on average. Besides increasing quality of IT service and lower membership fees, there will be another possible efficiency gain in price for derivative traders achievable. Derivative traders are able to put their collateral savings into a single pool, allowed to reach higher correlated products. Instead of having two large pools of collateral savings combined with different risk-allocated products, derivative traders now profit from a single pool with less collateral requirements and highly correlated products. Derivative traders actually can improve their profits by pooling all their collateral savings into one exchange, having the benefits from one clearing house and better allocated product combinations. Due to lower collateral requirements, derivatives traders can also invest their collateral elsewhere than in derivatives. Eventually, derivative traders do benefit from efficiency gain in price, because cost of posting collateral will decrease as the collateral requirements decline (while price remains the same).

Again, EC doubted the efficiency gain of collateral savings for derivative traders. The EC found that the nominal collateral savings must be translated into actual reduced cost savings for derivative traders. Collateral savings doesn't mean that the actual costs decrease with equal amount. Therefore, it is not the collateral savings but the opportunity costs of holding assets listed as collateral which is relevant for the measuring actual cost savings. Given the fact derivative traders have more free securities and cash after the merger, actual cost savings only represent a small fraction of the nominal

collateral savings proposed by DB/NYSE. The cost from investing free securities and cash elsewhere than in derivatives wouldn't differ much from posting free collateral in derivatives. Finally, the EC concludes that, even though collateral requirements are lower, DB/NYSE still has an incentive to raise the price of posting collateral. The price effect of posting collateral will outweigh the claimed efficiency, because of increasing market power and lack of competition in the European derivative market.

An argument against the statement of the EC here is that cost of posting collateral only partially has an effect on total transaction fee. The total transaction fees must be taken into account to decide the effect of the fees on derivative traders. However, it is unlikely that price of posting collateral increases because EC proved that opportunity cost of posting collateral don't differ all that much from the current costs of DB/NYSE. It would be unwise to raise fee of posting collateral after the merger, because a raise in this part of the total exchange costs would stimulate derivative traders investing their free securities and cash elsewhere.

4.7 Other possible sources of efficiency gains

Beside the arguments of efficiency gain explained by DB/NYSE, there are other possible sources of efficiency gain resulting from a merger. First, the less able managers in the organization will be substituted with more successful ones (Motta, 2004). When the exchanges merge, there will be a larger pool of managers to choose from. The new company retains the best managers of both exchanges and becomes more efficient.

Finally, when synergies arise mergers can create efficiency gains (Farrell and Shapiro, 2000). Synergies arise when firms pool their hard-to-trade assets and use new combinations to lower costs or improve quality. Synergies are often merger-specific, meaning that without the merger, this efficiency gain is impossible to achieve otherwise. For instance, exchanges sharing their derivative trader information base, the exchanges might gain key insights on how to target their next activities or innovations. Without the merger, both exchanges would not be able to achieve this result.

4.8 Possible efficiency losses

After a merger, the firm often reorganizes which results in dismissals of excess personnel. This might result in efficiency losses. First, managers and other employees (the firm's human capital) that are fired leave the company. With their departure, their know-how, experience and skills also leave the firm (Motta, 2004). In European exchange market managers/employees with knowledge about innovative derivative products are important. It is relatively easy to sell their information to another exchange in the market. When too many specific skilled employees leave, their core source of existence might deteriorate.

Second, it is difficult to lay off excess (IT) personnel, because contracts make it difficult. As a result, the exchange cannot reduce the amount of personnel and save on their costs as much as they would perhaps like. In this case the best solution the firm has is to re-assign existing employees in the most profitable way.

Some effects that relate to the reduction of competition result in efficiency losses. When the DB/NYSE merger would be approved, this results in a reduction of direct competitors. The EC concluded that the merger would create a monopoly on the European derivative market. Mainly because of the high entry barriers in the exchange industry, it is likely that dominant exchanges will have more market power. This market power has several implications on cost-efficiency. When replacement effects are sufficiently large, the incentive to innovate will be reduced (Motta, 2004). Even though an exchange with market power can get profits more easily, the exchange might still decide not to innovate. A company with market power cannot gain much extra market power by innovating, thus the investments in innovation are less profitable for these firms. Since these investments are likely to be profitable for the exchange in the long run because of lower future costs, this is a dynamic inefficiency.

4.9 Concluding remarks efficiency gains

A merger can make the exchanges either more or less efficient. The efficiency gains brought forth in court were not sufficient enough towards the EC. The possible efficiency losses will only contribute to the decision of the EC. Still, the efficiency gains can play a supportive role in lowering transaction fees of DB/NYSE. A higher market share gives DB/NYSE an incentive to raise transaction fees. By setting transaction fees, an exchange is always cautious. If transaction fees are too high, liquidity²⁷ might not be optimal. Therefore, the proposed efficiency gains could have a supportive role in which DB/NYSE can keep or lower transaction fees.

²⁷ The relation between liquidity and transaction fees is further explained in chapter 5.

Chapter 5: Liquidity

5.1 Introduction

In this chapter liquidity on the exchanges will be explained. This chapter will start with an explanation of liquidity. Liquidity could be measured by the bid-ask spread, market depth and trading volume. All three variables are determined by behavior of derivative traders, exchanges and the amount of competition. This part will also explain why liquidity is important for exchanges and derivative traders²⁸. The second part consists out of an analysis of liquidity after the DB/NYSE merger. The analysis contains a demonstration of various variables that affect liquidity in competition and monopoly. This section explains if liquidity is more likely to rise in a competitive market or monopolistic market. The behavior of liquidity after the NYSE/Euronext merger is also explained. This information could give supportive information about liquidity after the current merger. The third part consists out of an analysis of the liquidity effects for public derivative traders. This involves an analysis of which role asymmetrical information has on public derivative traders and dealers.

5.2 Liquidity

This chapter defines liquidity in financial derivative market. This chapter explains why liquidity is important for exchanges and derivative traders. Then a simple analysis of how liquidity is formed on exchanges is illustrated and at last analysis how dealers affect liquidity on an exchange is explained. After this last analysis it should be noticeable if dealers prefer a competitive market or a monopolistic market.

Liquidity can be explained as the rate in which derivatives can be traded on an exchange²⁹. A market is liquid in the sense that any amount derivatives can be bought or sold immediately (Bailey, 2005). A market where liquidity is high indicates that derivatives can be bought or sold near the current price. This means that the spread between buying and selling price is narrow. As stated, derivatives reduce the uncertainty for devaluation of assets or uncertainty for appreciation of liabilities. The second reason why derivatives exist are the developments in investing opportunities. Dealers buy and sell in derivatives for the lowest bid-ask spreads and accelerate liquidity of established firms. Established firms compete with providing high liquidity by offering many derivatives, automated operation systems and low transaction fees. As said, cross-margin effects also arise if all of those services are offered.

²⁸ Derivative traders: Public derivative traders and market makers/dealers.

²⁹ It represents the interchange ability of derivatives (Bailey, 2005).

Liquidity is the most important market mechanism on the derivative market. DB and NYSE compete in similar derivatives which are highly substitutable. In order to differentiate themselves and continuously attract derivative traders, these exchanges provide highest liquidity as possible. In order to provide high liquidity, exchanges must have a low bid-ask spread. It can be stated that a low bid-ask spread affects the behavior of derivative traders, but this doesn't prove that actions of derivative traders completely depend on the spread. The amount of traders and market depth³⁰ are two other important indicators which explain decisions of derivative traders. Furthermore, the variables that influence liquidity are relevant. The amount of competition, transparency and market form³¹ all affect liquidity on exchange. This will be investigated in the next section. The following analysis shows the basic developments of liquidity without all affecting variables.

5.2.1 Liquidity-analysis

This analysis is developed by (O'Hara and Pagano, 1995)³² and contains two periods. The model completely abstract from asymmetric information and includes only liquidity on multiple exchanges. In the model the incentives of derivative traders and other traders are affecting liquidity. Each derivative trader guesses what other traders will demand and choose his own trade to maximize its own profits.

The first important fact is that if the number of traders N in market increases, the volatility of the price lowers. First, the number of traders has an effect on stability of bid-ask spread. The bid-ask spread will be lower if the number of traders increases in the market. Due to higher amount of traders on an exchange lead to less risky derivative contracts. Derivative traders usually are able to find an opposite party quicker. If a contracts defaults it is easier to find a new party when there are many traders on an exchange. Normally, this will lead to lower expected utility of derivative traders. Second, the increasing number of derivative traders N will have positive effects on liquidity in the market. The bid-ask spread of derivatives is lower which implies that the trading volume increases. If the prices on the market have closer margins and become more stable, matches between buyer and sellers become easier. The expected utility of derivative traders increases again, because liquidity on the market is higher.

What if derivative traders can choose between two markets? The number of traders eventually affect the expected utility of the traders self. If there are no fees on the

³⁰ The market depth can explained as the volume in which larger derivatives could be traded without having an effect on the bid-ask spread.

³¹ Quote-driven markets or order-driven markets.

³² The actual source of this model comes from "Trading Volume and Asset Liquidity" by M. Pagano (1989).

exchange market, markets of DB and NYSE are identical. If a derivative trader expects that the amount of traders is equal in DB and NYSE, traders are indifferent between those markets. If a derivative trader expects that DB has more traders than NYSE he will choose DB. In fact all new traders choose DB. This implies that there is an equilibrium in the market with two competitors. The traders in this model are influenced by the decision of others which leads to a Nash-equilibrium.

A balance across two exchanges can exist if a derivative trader spreads his asset equally. A trader splits his assets every time liquidity on the other exchange is higher. If the probability of trading derivatives on DB temporarily is higher, he will use more underlying asset to trade in this market. The trader can still find a balance between two exchanges if the liquidity of market NYSE becomes higher for a certain type of derivatives. In practice most derivative traders trade their underlying asset on one exchange, because they deal with transaction fees and switching costs.

5.2.2 Strategy of dealers

The advantage that monopolistic exchanges have is that more dealers can maximize profits on average. This pricing strategy implies that an expected loss in one sort of derivatives but an expected profit in another sort of derivatives. The market is rather able to remain stable and liquid (O'Hara, 1995)³³.

Suppose dealers can buy and sell derivatives based on average expected profits across a pool of derivatives instead of one trade at a time. Dealers can win margin on trades and lose margin on other trades if the market power is sufficient. If the exchange has sufficient market power dealers are able to apply the average profit strategy. This argument (O'Hara, 1995) indicates that dealers losing margins on large priced derivative trading but wins margins on small priced derivatives in a monopolistic market. The highly frequent small trades are able to compensate the losses on highly frequent large trades. *By applying this strategy, monopolistic exchanges (DB/NYSE) including dealers are able to keep trading volume derivatives in check.* In this analysis dealers choose to allocate small and large trade prices so that volatile small derivatives will offset the loss in large derivatives. Dealers prefer monopolistic market power to compensate the expected losses. Losses that dealers are required to make in order to keep liquidity stable in the market. Eventually, this argument inclines that from a social welfare perspective a monopoly is preferred. Dealers are rather able to use average expected profit strategy in a monopoly than in competition.

³³ The actual source comes from "Insider trading, Liquidity, and the Role of the Monoplist" by L. Glosten (1989).

5.3 Liquidity after DB/NYSE

This section will analyze the liquidity after the DB/NYSE merger. The first part explains how the number of derivative traders affects liquidity in a competitive and a monopolistic market. The second part includes market depth to the analysis. It explains how market depth will affect the liquidity in a competitive and monopolistic market. In addition, the relation liquidity and transaction fees will be further explained. Third, a liquidity-analysis of the previous NYSE/Euronext merger will be illustrated. The information of this analysis can give an indication towards liquidity after the DB/NYSE merger. At last, the statements of the EC about liquidity will be compared to the content in this chapter. It should be provable that the statements of the EC about liquidity are insufficient.

The effect of the amount of traders on liquidity is already explained in the previous section. By an increasing amount of traders³⁴ at an exchange, the bid-ask spread should be small. Derivative traders should be able to find an opposite party quicker if a contract defaults. A smaller bid-ask spread usually indicates that liquidity will increase. This raises the question whether liquidity will be higher in a monopolistic or competitive market. The trading volume is the first variable that should be investigated. In a competitive market both exchanges (DB and NYSE) would compete for the most traders in order to increase liquidity. An exchange can reach an optimal liquidity outcome given the outcomes of the competitor. A monopolistic exchange (DB/NYSE) could provide optimal liquidity in the market. All European derivative traders are pooled into one exchange. The DB/NYSE merger (monopoly) would improve liquidity in European derivative market.

Now the variable market depth will be introduced into the liquidity analysis. If traders in DB and NYSE are equal (Pagano and O'Hara, 1995) and the market depth is different, shifts of derivative traders can occur. This can be stated as $N_{db} = N_{nyse}$ and variance $DB \neq \text{variance NYSE}$ ³⁵. If the speculative value of derivatives in one market is higher than in the other market this implies that larger derivatives are traded. *The market depth represents the volume in which larger derivatives could be traded without having an effect on the bid-ask spread.* If the market depth is larger this implies that a market has larger derivatives. Trading larger derivatives affects the bid-ask spread negatively which could result into a more risky and a less liquid exchange. If the market depth increases, larger derivatives could still be liquid enough. If the market depth decreases, larger derivatives have less chance to be liquid enough. The exchange with a higher market

³⁴ An increase in the amount of traders indicates that the trading volume increases.

³⁵ Variance $DB \neq \text{Variance NYSE}$. Variance represents the speculation in the market. A higher speculation means that size of derivatives traded is larger. If the market depth is larger, this implies that trading larger derivatives have bigger effects on bid-ask spread. Out of larger derivatives follows higher speculative market value which usually implies that bid-ask spreads are higher and liquidity is lower. Exchange can try to compensate this by lowering transaction fees.

depth still can try to compensate their riskier and less liquid market by lowering transaction fees. As explained previously, an equilibrium in traders between two competing exchanges can exist if shifts in transaction fees are significant enough. After introducing transaction costs and asymmetrical information, market depth is a third variable³⁶ that has an influence on liquidity. In a market where a competing exchange has a lower market depth, transaction fees will have a *compensating* role. The exchange will compensate less liquid markets by lowering transaction fees.

If $N_{db} = N_{nyse}$ ³⁷ and market depth variance $DB = \text{variance NYSE}$, lower transaction fees have an *encouraging* role for derivative traders. In this situation the size of derivatives, amount of traders and liquidity are equal. Under these conditions an equilibrium will occur for the firm with lowest transaction fees. The expected utility for derivative traders will be higher with lower transaction fees and equal liquidity than the expected utility for derivative traders with higher transaction fees and equal liquidity. Equal market depth implies that size or heaviness of derivatives are similar (both market have similar amount of small and large derivatives). Traders are more willing to pay higher fees in a liquid market than higher fees in illiquid markets. Derivative traders balance between trading small derivatives against higher transaction fees or large derivatives against lower transaction fees. On the exchange with lowest transaction fees, derivative traders usually trade more large derivatives than small derivatives. Eventually, liquidity in both types of derivatives will lead to the final decision of the derivative trader. In practice, exchanges are very carefully about setting higher transaction fees. Small derivatives represent the major part of liquidity on the exchange. By raising transaction fees too high, derivative traders can leave the market (because it is not profitable anymore). Again, this can lead to a less optimal liquidity on the exchange.

Eventually all traders will shift to the exchange with highest trading volume, largest market depth and most liquidity. Transaction fees can play an *encouraging* role if liquidity and market depth is equal on both exchanges and a *compensating* role if an exchange has too little market depth. Due to the size of derivatives, liquidity, transaction fees and different preferences of traders a competitive equilibrium is possible in the market. Still, there remains a natural incentive for exchanges to merge over time, because it improves the liquidity and stability of derivatives.

³⁶ Beside market depth, bid-ask spread and trading volume are important indicators for liquidity.

³⁷ N_{db} and N_{nyse} : Number of derivative traders.

Concluding remarks

After this analysis a monopolistic price-setter would be preferred. A monopolist is able to increase profits for everyone. Derivative traders benefit from lower bid-ask spread, larger market depth and higher trading volume after consolidation. Exchanges benefit from increased number of derivative traders. A monopolistic exchange is able to offer low and stable bid-ask spreads. As shown, this has a positive effect on the liquidity. Transaction fees may rise after the merger, but a monopolist must be cautious. Higher transaction fees have an effect on dealers and public derivative traders. With higher transaction fees, dealers are less effective in accelerating liquidity on the exchange. A merger means that all markets tend to be less speculative resulting, in the first place, in lower profits for public derivative traders. Then, public derivative traders will trade more often in derivatives which increase the profits of DB/NYSE more than before the merger. Therefore, DB/NYSE must consider if they really want to raise transaction fees.

5.3.1 Other effects on liquidity

Besides the previous analysis there are other variables that have an effect on liquidity on a merged exchange. In general, if an exchange obtains market share it not only attracts European derivative traders but also foreign derivative traders. A monopolistic exchange is able to attract more foreign derivative traders. Often a monopolistic exchange benefit from foreign derivative traders, because they accelerate the trading volume/liquidity even more. Foreign derivative traders tend toward exchanges with a high market share because the visibility, size and transparency are better. This development after a merger has a positive influence on the stability of liquidity. DB/NYSE would benefit from this additional effect.

DB/NYSE would be the largest exchange in the European derivative market which has network effects³⁸ on derivative traders. Derivative traders naturally tend to be more familiar with established firms. If those firms become larger it is relatively better to join familiar exchanges. Smaller exchanges become less relevant compared to the merger of DB/NYSE. This psychological effect of humans has a positive influence on the liquidity of DB/NYSE. Small exchanges only have a chance in small specific markets. Again, this would stabilize the liquidity of DB/NYSE.

DB/NYSE has several main cities where exchanges are settled (Amsterdam, Frankfurt, London, Paris, etc.). The established exchanges in the most accessible city are able to gather more liquidity than exchanges in less accessible cities. Foreign derivative traders

³⁸ Network effects explain actions of derivative traders in the financial markets. Derivative traders derive utility from the number of other derivative traders that choose the same exchange and derivatives. This is a psychological effect, because derivative traders base their choices on what other people will also do. The larger the number of derivative traders on an exchange, the stronger this effect becomes (Motta, 2004).

(US) tend to shift towards more accessible cities. Monopolistic exchanges must always make sure that main cities are equally accessible. If not, liquidity could not be optimal for DB/NYSE. Derivative traders (including foreigners) could choose the exchange which is most accessible. Exchanges of DB/NYSE in less accessible cities have less liquidity. This partially deteriorates liquidity for the merged firms.

5.3.2 Liquidity developments NYSE/Euronext

In this section historical development in liquidity of NYSE Euronext³⁹ will be reviewed. In 2000 a merger in European exchange market occurred between NYSE and Euronext (NYSE/Euro). The consolidation of NYSE/Euro is more or less similar to the recent consolidation proposal of DB/NYSE. Exchanges NYSE and Euronext were equal competitors in the European derivative market. By the approval of the EC, the merger of NYSE and Euronext led to a significant additional market share. Besides additional market share, developments in liquidity could be investigated which could which can be an important indicator about liquidity developments of the current DB/NYSE merger. Out of empirical data of NYSE Euronext (Nielsson, 2007), information could be derived for analyzing developments in liquidity after DB/NYSE merged.

Before reviewing the empirical data, it must be stated that conclusions about liquidity after NYSE/Euro cannot be perfectly applicable to DB/NYSE. Empirical data must be approached with caution, because the market situation is different. While NYSE/Euro captured a larger market share and still had some competitors in Europe, DB/NYSE would capture nearly the whole European derivative market. A higher market share may have stronger effects on liquidity in the proposed DB/NYSE merger than in the former NYSE/Euro merger. Still, the former merger resulted in an increase in market share along with an increase in liquidity. An increase in liquidity implies that the bid-ask spread tends to be less in the European market. Various factors have an influence on the bid-ask spread which is investigated in the previous part. In this part empirical results of developments in liquidity after consolidation of NYSE/Euro will be analyzed (Nielsson, 2007).

The investigation of liquidity after the NYSE/Euro merger could be an important indication of developments in liquidity after the proposed merger DB/NYSE. The expectation is that an exchange merger captures higher market shares because more derivative traders are willing and forced to trade at the established exchange. Therefore, bid-ask spread tends to go decrease which then have a positive influence on liquidity. For the analysis of developments in liquidity about the former merger NYSE/Euro a dataset of all European

³⁹ From now on abbreviated NYSE/Euro.

active Euronext exchanges is available⁴⁰. The dataset contains developments in turnover, market depth and bid-ask spreads from 1996 till 2006. Note that figure 1 and 2 shows the turnover which represents liquidity on the exchanges. The turnover is defined as the number of shares traded in an exchange firm relative to the number of outstanding/listed shares in an exchange. It captures the amount of trading that takes place among market investors. Besides the turnover, market depth and developments in bid-ask spreads are also analyzed. A significant change in liquidity after the merger should be noticeable.

Information in figure 1 and 2 is based on an empirical data. Figure 1 shows the turnover spread among big international Euronext exchanges and smaller Euronext firms. In figure 1, it seems that turnover/liquidity eventually increases and becomes more stable after some time. In fact, NYSE and Euronext have a natural incentive to merge, because liquidity eventually goes up. If the turnover/liquidity on the market is low, the incentive to merge becomes greater. In the pre-merger state the turnover/liquidity of NYSE and Euronext was too low. A merger in this case provides an injection of more shares traded compared to the amount of open listed derivatives. It can also be stated, that turnover/liquidity increases slow but steady after the merger. This implies that European derivative traders and other derivative traders shift towards NYSE/Euro. In fact, foreign derivative traders are more likely shift towards NYSE/Euro. The merger becomes more visible and transparent for foreign derivative traders compared to smaller European exchanges. Figure 2 compares the trend in liquidity among NYSE/Euro exchanges in Europe. This figure shows an overall increase in turnover/liquidity among different NYSE/Euro exchanges. Note that must be made is, that the different trends in figure 2 across exchanges may be unrelated to the merger. The location of the exchange has an additional effect on developments in turnover/liquidity which may be unrelated to a merger.

Besides trading volumes, developments in bid-ask spreads and in market depth, are also important indicators for analyzing liquidity. Bid-ask spreads capture the difference in bid and ask prices between buyers and sellers of derivatives. If the difference between bid and ask prices are low, liquidity is more likely to rise on the exchange. Table 7 (column 3 and 4) shows the regression statistics of developments bid-ask spreads of NYSE/Euro. The results are mostly significant and indicate that NYSE/Euro have narrower bid-ask spreads across NYSE/Euro exchanges after the merger. Column 3 significantly indicates that NYSE/Euro on average have narrower bid-ask spreads. Column 4 proves that this is mainly driven by the four big NYSE/Euro exchanges. The market depth captures the frequency in which large derivatives can be traded without a change in bid-ask spread.

⁴⁰ In obtaining the data about NYSE Euronext, U. Nielsson used many sources for his own investigation. In this thesis there will be referenced to U. Nielsson, 2007, because the data sources are too many to name.

Normally, the larger derivatives are in the market, the more influence it has on the liquidity. For the analysis of the market depth Table 7 (column 1 and 2) is applicable. The market coefficient of the merger in column 1 is significant which implies that NYSE/Euro as whole benefited from improving market depth. Column 2 is different in that it significantly indicates that market depth improves on the big NYSE/Euro exchanges and not on the smaller NYSE/Euro platforms.

After analyzing the turnover, developments in bid-ask spread and market depth it can be concluded that liquidity after the merger is increased. The turnover is likely to increase after the merger, because it is mostly influenced by an increasing amount of European derivative traders and foreign derivative traders. Due to the size, visibility and transparency of the merger derivative traders from outside Europe tend to increase trading at NYSE/Euro. Also developments in bid-ask spread and market depth after the merger led to positive outcomes in liquidity for NYSE/Euro.

Either, the merger of NYSE/Euro seems to have captured a sufficient part of European derivative market last years. NYSE/Euro still faces some competitors in the European market. The merger of DB/NYSE, in contrast, would capture 90% of the European derivative market. This implies that liquidity behaves in a similar pattern with the merger DB/NYSE. Therefore, the results that are presented by U. Nielsson can have a supportive role for analyzing liquidity behaviour of DB/NYSE.

5.3.3 Argument liquidity of the European Commission

The last efficiency gain DB/NYSE brought forward in court is the liquidity impact of the merger⁴¹. Pooling two European exchanges into one will have positive effects on the derivative traders. Due to higher liquidity there will a reduction in implicit costs and higher explicit profits by trading and clearing derivatives. With an increasing settlement of contracts on the exchange, derivative traders benefit from lower average implied trading cost and higher explicit profits. The implicit costs resulting from trading in derivatives with underlying assets become lower compared to the costs of using that underlying asset for something else. In the case (e.g.) where the explicit price after the merger remains equal compared to the pre-merger, liquidity and profit for derivative traders increases. This results in lower implicit trading costs. Then also explicit profits are increasing, because derivative traders are able to trade more financial contracts satisfying their own profit maximizing behavior.

This thesis based increasing liquidity of DB/NYSE partially on former studies of NYSE/Euronext. NYSE/Euro shows a steady increase in trading activity/liquidity after the merger. Either, historical data is not a guarantee for increasing liquidity in the current

⁴¹ Source: Case Deutsche Börse / NYSE Euronext, 2012.

merger according to the EC. All sorts of variables, as size of the market, underlying assets, time, economic crisis, etc., will lead to different outcomes in liquidity. The EC stated that the effect of the merger on the liquidity is not significantly verifiable and therefore the liquidity argument is insufficient.

This chapter proved that there is enough evidence to assume that liquidity will increase after the DB/NYSE merger. Therefore, the statements of the EC about liquidity are insufficient.

5.4 Liquidity and derivative traders

In this section the effects of asymmetrical information on derivative traders will be analyzed. Asymmetric information could have a deterring effect on public derivative traders. In contrast, informed dealers would benefit from more asymmetrical information. In this analysis asymmetrical information explains behavior of public derivative traders and informed dealers. This raises the question whether public derivative traders, considering asymmetric information, rather trade in a competitive or monopolistic market. It is important to investigate if asymmetrical information tends to be less in a monopolistic or competitive market. Furthermore, an analysis of transparency of quote-driven markets and order-driven markets will be provided. Both forms have a different transparency and have a different impact on derivative traders and exchanges (and liquidity). At last, an overall conclusion can be made about the transparency in a monopolistic or competitive market.

5.4.1 Dealers and public derivative traders

Dealers play an important role in providing continuous stable liquidity on the exchange. In order to increase liquidity on the exchange, players as DB and NYSE offer certain privileges to dealers⁴². Here, dealers try to make a profit because they are able to allocate their underlying assets effectively. This implies that dealers have pre-information about profitable derivatives. Dealers benefit from privileges if there is little information in the market. *For example, if information on the market is low, bid-ask spreads tend to go up. Dealers benefit from this because they are able to position their derivatives more effectively. This gives uninformed derivatives traders an incentive to leave the market, because the margin between bid and ask becomes too high.* In a competitive or monopolistic exchange market, dealers always get an advantage towards uninformed derivative traders. This raises the question how asymmetric information in a competitive market and a monopolistic market affects behavior of public derivative traders.

Dealers aim to accelerate liquidity on the exchanges. In this analysis behavior of dealers in a competitive (which usually has a lot of asymmetrical information) and monopolistic

⁴² The theory in chapter 5.4.1 is supported by “The Economics of Financial Markets” by R.E. Bailey (2005).

market (which usually has less asymmetrical information) is explained. Dealers act on multiple markets having an information advantage towards uninformed public traders. Uninformed public traders are unaware and trade in one exchange (O'Hara and Pagano, 1995)⁴³.

With the allocation underlying asset of public derivative traders in all competitive markets, dealers are able to allocate their underlying assets across multiple markets. Informed dealers can choose to split their underlying asset in the most effective derivatives in multiple markets. Uninformed public traders in competitive markets are followers because many decisions depend on the behavior of informed dealers. This again, has an influence on the bid-ask spread.

In this analysis can be assumed that behavior of liquidity is influenced (at least for a big part) by informed derivative traders. Either, public derivative traders are able to observe bid-ask spreads. Since they not have enough information they are not able allocate their underlying asset efficient enough in derivatives across multiple derivative markets. Informed derivative traders can allocate their asset across multiple markets. Uninformed derivative traders are required to follow behavior of market prices mainly set by informed traders. This allows informed derivative traders to act more aggressively in every market by raising selling prices. Again, informed traders benefit from the unaware, public traders who are active in one market. This mechanism ignites the provision of liquidity on exchanges, because derivative traders are natural followers. In addition, dealers who reveal their selling price lose their information advantage along with other dealers of the derivative. Other informed traders must follow because else they will lose profit by the transparent market price. Here competitive exchanges have a task to hide all sorts of market indicators in order to remain competitive.

In a monopoly informed derivative traders offsetting public derivative traders tend to be less. First, the amount of available information for public derivative traders increases after a merger. Pooling more traders in one place provides more information and transparency than in competition. Second, informed dealers have less opportunity to benefit from allocating their assets across multiple markets

⁴³ The actual source of this model comes from "Transparency and Liquidity: A Comparison of Auction and Dealer Markets with Informed Trading by M. Pagano and A. Roell (1993).

5.4.2 Quote-driven markets and order-driven markets

In a quote-driven market⁴⁴ where risk of large derivatives is too great, dealers aren't effective. Dealers in this case, can't quote the price that is profitable and trade not enough small derivatives to offset the loss on large derivatives. Since there are not third parties allowed to observe the bid-ask spread in a particular market, large derivatives have volatile bid-ask prices. Trading large derivatives in this market is difficult. Note that this argument is less applicable to the order-driven market.

Order-driven markets⁴⁵ facilitate matches between buyers and sellers of derivatives 'auction wise'. These derivatives are directly listed on the exchange. The more participants in a specific derivative market, the more liquid this market becomes. Large derivatives are relatively easier to trade, because the transparency increases trading volumes on order-driven markets. More information on a market normally leads to stable bid and ask prices for derivatives. Trading large derivatives in this market is relatively easier compared to quote-driven markets.

Therefore, the trading form is relevant derivative traders. Asymmetric information induces shocks into behavior of bid-ask spreads. It may be that a competitive market is not resistant against increasing information on the market. If information in a competitive market is low, bid-ask spreads tend to rise. Competing exchanges like DB and NYSE lose liquidity if information is low (or if there is a lot asymmetric information). Derivative traders tend to leave the market quicker if bid-ask spread are larger. Increasing information difficulties on the market can be mitigated by dealers pricing on average rather than pricing on competitive based decisions. Therefore, it is necessary that dealers operate in a monopolistic exchange rather than a competitive exchange. This is why a monopolistic exchange is able to perform better in a market where there is little information.

This analysis explained the influence of asymmetric information on bid-ask spreads in two different markets. A monopolistic exchange is able to strengthen liquidity on the market by dealers who accept an increase in price of small derivatives and a decrease in the price of larger derivatives. This mechanism works if dealers have pre-information by the exchanges or other authorities. A comment can be made about this conclusion, because uninformed public traders of small contracts have an incentive to leave the market if the price is too high. Especially in a monopolistic market, where the prices of

⁴⁴ Quote markets are those in which dealers quote *bid* and *ask* (or *offer*) prices at which they are prepared to buy or sell specified quantities of the asset (Bailey, 2005).

⁴⁵ Order driven markets are those in which traders issue instructions that specific actions should be taken in response to the arrival of publicly verifiable information, such as a price observation. The price is then adjusted by an 'auctioneer' until the total orders to buy equal the total orders to sell. (Bailey, 2005).

small derivatives tend to rise, derivative traders have an incentive participate less in contracts. This gives opportunities to third market exchanges (including dealers) to offer a lower bid-ask spread of certain derivatives. Those parties have short lifecycles, but constantly arise in the exchange market. The percentage that leaves the monopolistic exchange will not very high, but is still a remarkable amount and gives opportunities to new entrants.

5.4.3 Transparency

Most derivatives are traded in quote-driven markets. With the merger of DB/NYSE asymmetrical information will be reduced. A more transparent market gives opportunities to public derivative traders. Uninformed public traders have less incentive to leave the market based on less asymmetric information. Uninformed traders are able to make better decisions in the market, but still may decide that the bid-ask spread is too high on certain derivatives. As explained, an increase in bid-ask spread of small derivatives emerged by the average expected profit strategy of a dealers can still lead lack of growth in derivative traders. To conclude, asymmetrical information has a detrimental effect on derivative traders. In monopolistic market asymmetrical information tend to be less which has beneficial outcomes for public derivative traders.

Chapter 6: Merger remedies

The chance of approving a merger becomes greater if the merging firms adopt certain remedies. These remedies are necessary to guarantee that competition will be preserved in the market. Two types of remedies are proposed to the EC; structural remedies and behavioural remedies (Motta, 2004). The former modifies allocation of the property rights and the latter set constraints on the firms' property rights. As discussed earlier, DB/NYSE proposed certain remedies that give a better guarantee keeping transaction costs in check. However, these remedies were not sufficient to convince the EC that the merger would not harm competition. In this section, these proposed remedies are discussed in greater detail.

DB/NYSE proposed a structural remedy that requires the merged firm to divest some its derivative contracts. DB/NYSE offers a divestment in a certain kind of equity index derivative contracts. These divestments would guarantee that the exchange market is still competitive enough. The remedy of NYSE considers divestments in NYSE Liffe's single stock equity derivatives including all intellectual property, employees, clearing house and data. Through (NYSE) Eurex still has a part of the single stock equity derivatives, but NYSE considers this 'divestment worthy' to give opportunities to competitors. DB will also divest in their single stock equity derivatives in the ETC- and OTC-market. By divesting in single stock equity there is some room for competition, while DB/NYSE is able to focus on their remaining and new innovative derivatives. The question raises whether this remedy is sufficient to restore competition on the European exchange market, considering the fact that NYSE only partially divest in the (commercially attractive) single stock equity derivatives.

The EC decided that the commitments were insufficient, because the competition will not be restored. An increase in competition will not occur, because the advantage of the divestment for entrants is just a minor part compared to the enormous competitive advantages that DB/NYSE has on the European exchange market. Entrants in Europe facing very high entry costs and a small/minimal position on the market with single equity stock derivatives. Therefore, it is very challenging and risky for entrants to establish themselves and compete in the market.

DB/NYSE also submitted a behavioural remedy which gives new entrants advantage. New entrants who differentiate themselves with new innovative products benefit from a one year ahead advantage. This raises the credibility of the real advantage that new entrants have, because after a one-year time zone new products are allowed to be duplicated by DB/NYSE or other firms. DB/NYSE acts aggressively and benefits from

better distribution and liquidity for the duplicated products. The profits for new entrants on the market will push them out of the market.

The last remedy DB/NYSE introduced to the EC is a behavioural commitment that contains software licences for interest rate derivatives. Independent third parties have the ability to buy a license in which they become their own exchanges. However, third parties still pay a considerably relevant amount of cost for trading identical interest rate derivatives. For clearing defaulted derivatives third parties still enter the exchange of DB/NYSE. Capturing market share in derivative market remains nearly impossible, because entrants still facing barriers to entry with accessing margin pool of correlated contracts and additional licence costs.

Chapter 7: Conclusion

The EC stated that the merger DB/NYSE leads to fragmented buyer power and lower threats of entry. This would give DB/NYSE an incentive to raise transaction fees which affects the opportunities of derivative traders. Normally, the EC has a fair point in proving that a higher market power⁴⁶ leads to higher consumer prices. An exchange merger is different because, liquidity can have a compensating effect when transaction fees are rising. A merger with higher market power would not always affect derivative traders negatively because increasing liquidity could result in additional welfare for derivative traders. This thesis has shown that the conclusions of EC were insufficient.

The liquidity-analysis indicates that in a competitive derivative market no one could fully optimize their profits. The conclusion is that exchanges and derivative traders maximize their profit when liquidity is high. Therefore, exchanges have a natural incentive to merge in order to increase liquidity in the market. This effect is natural, because all sorts of derivative traders benefit from this too (Pareto-improvement). This incentive could be proved by the analysis of the NYSE/Euro merger. Even though NYSE/Euro merged on a smaller scale, the effects of this merger on liquidity are a sufficient indication of what would happen with liquidity after the DB/NYSE merger. Results show that developments in trading volume, bid-ask spread and market depth were all positively related to the merger. This inclines that an exchange merger has a positive influence on the liquidity of merged exchanges. Since NYSE Euronext still had some competitors, they couldn't reach their full liquidity potential yet. A monopolist as DB/NYSE in contrast, would be able to maximize liquidity on the European market. In addition, the merger DB/NYSE would give more international exposure. This could benefit liquidity on the exchange even more.

The transaction fee model shows that when an exchange merger occurred, derivative traders suffering from higher transaction fees. This analysis corresponds with the statements of the EC report. In contrast to this, developments in liquidity could compensate higher transaction fees. Higher liquidity in the market is only feasible if DB and NYSE would merge. A monopoly as DB/NYSE on the European market would indeed improve opportunities for derivative traders due to improving liquidity. In addition, DB/NYSE should be cautious with raising transaction fees on the market. An exchange monopolist must outweigh gaining from higher transaction fees (and less increase in liquidity) with equal transaction fees (and a higher increase in liquidity).

By an increase of asymmetric information dealers allocate their assets more effectively. By applying this strategy, dealers have a negative impact on the revenues of public

⁴⁶ Higher market power because market share is increased.

derivative traders. With low information on a market, dealers are able to allocate their assets across markets which are detrimental for public derivative traders. Therefore, a monopoly is more profitable for public derivative traders. A merger of DB/NYSE makes the market transparent and the market would have less asymmetrical information. Public derivative traders benefit from higher transparency which has a positive effect on the bid-ask spread (and so liquidity). In a monopolistic market, dealers also tend to behave differently. Dealers are more likely to apply the average expected profit strategy instead of maximizing profits across markets. This makes sense, because a monopoly has less asymmetrical information. There are fewer opportunities for dealers to offset uninformed public traders. In a monopoly dealers are focused on maximizing profit by increasing/stabilizing liquidity with the average expected profit strategy. In addition, higher transaction fees could also have detrimental effects on the average expected profit strategy of dealers. A monopolist risks his liquidity if transaction fees rise too quickly.

To complement the beneficial outcomes in liquidity of an exchange merger, efficiency gains brought forward by DB/NYSE. DB/NYSE and derivative traders would benefit from economies of scale, collateral savings and less implicit trading cost. Even though the EC found these efficiency gains insufficient, these arguments are still relevant if they are combined with the liquidity analysis. Due to the efficiency gains, incentives to raise transaction fees wouldn't have to arise if efficiency gains are sufficient.

The EC has a fair point that the merger leads to a lower threat of entry. After the merger this would be a serious issue on the European exchange market. The submitted remedies were also insufficient to give opportunities for new entrants. Still, in new emerging markets ('niche' markets) there are always possibilities for new entrants.

The EC stated that the merger would affect derivative traders negatively, because the transaction fees will increase. In this multiple analysis implies that derivative traders benefit from a merger. A larger exchange creates opportunities for derivative traders and exchanges. The EC had a too narrow view on the DB/NYSE merger. They didn't take into account the possibilities that derivative traders would have after the merger. This thesis has shown that there is enough evidence that a European exchange merger isn't detrimental at all for derivative traders. In fact, the DB/NYSE merger could result in an increase in European social welfare.

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Appendix

Figure 1 and 2

Figure 1. Turnover Trends Across Euronext Firms

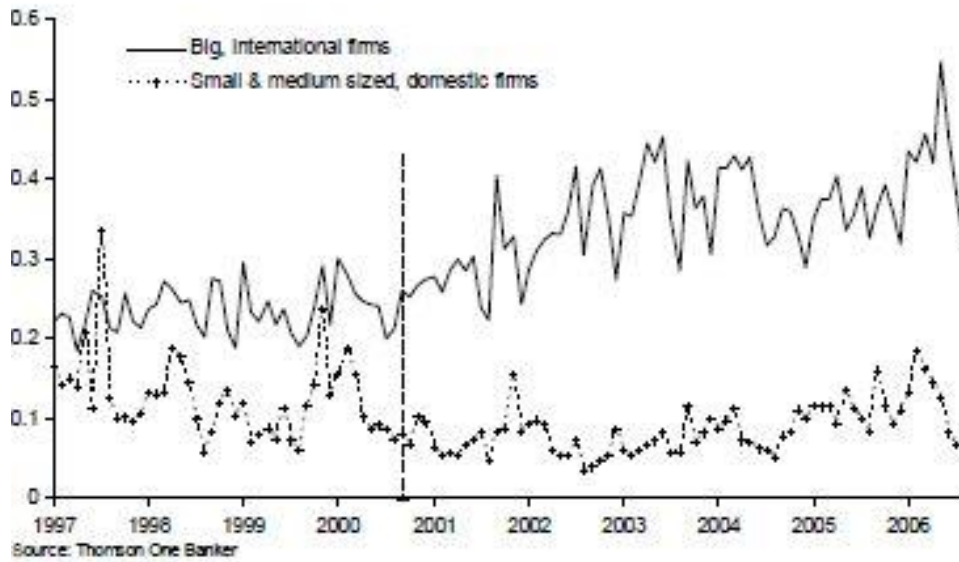


Figure 2. Turnover Trends Across Exchanges

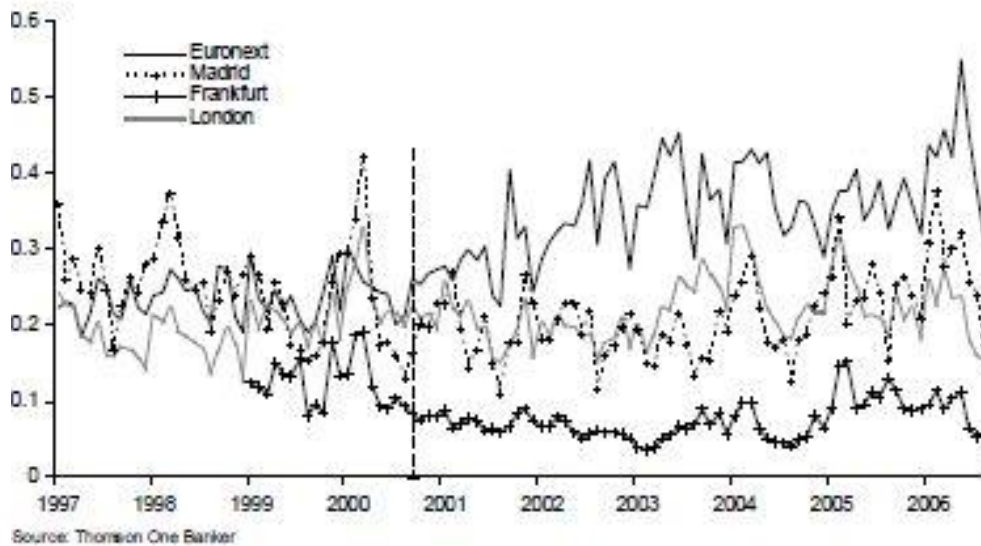


Table 7. Column 1,2,3 and 4

Table 7. Merger Effect on Other Outcome Variables

The merger dummy shows the combined effect of all four merger events on the Amivest liquidity ratio, bid-ask spreads, stock returns and volatility. The Amivest liquidity ratio captures market depth as it represents the value of volume associated with a unit change in price, i.e. Euros traded per 1% change in price. Bid-ask spreads capture the cost dimension to liquidity and are defined as a percentage of the mid-quote. Returns are measured as daily percentage changes in price and volatility is measured by a rolling estimate (a moving average) of standard deviation over the past 20 business days, which is then scaled to annual volatility for easier interpretability (i.e. multiplied by square-root of 250). Firm size and foreign sales are dummies indicating whether the firm was big/small (in terms of market value) or had foreign sales at the outset of the merger period. Robust standard errors are reported in parenthesis, clustered by security to allow for heterogeneity and autocorrelation within securities. Significance is reported at the 10% (*), 5% (**) and 1% (***) level.

	Ln(Amivest)		Ln(Spread)		Returns		Ln(Volatility)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Merger	0.22* (0.13)	0.01 (0.14)	-0.16*** (0.03)	-0.01 (0.05)	0.27*** (0.04)	0.25*** (0.05)	-0.36*** (0.03)	-0.34*** (0.05)
For.sales * Merger		0.19* (0.11)		-0.21*** (0.06)		-0.01 (0.06)		-0.02 (0.06)
Small * Merger		-0.00 (0.21)		0.17 (0.14)		-0.10 (0.18)		0.18* (0.10)
Big * Merger		0.90*** (0.26)		-0.68*** (0.23)		0.45*** (0.17)		-0.30* (0.18)
For.sales * Small * Merger		-0.03 (0.33)		0.02 (0.22)		0.25 (0.25)		0.42** (0.18)
For.sales * Big * Merger		-0.29 (0.31)		0.35 (0.25)		-0.18 (0.18)		-0.04 (0.20)
Constant	0.62 (0.78)	0.81 (0.76)	-4.03*** (0.02)	-4.03*** (0.02)	0.25** (0.12)	0.26** (0.12)	-1.97 (0.02)	-1.97 (0.02)
Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data frequency	Monthly	Monthly	Daily	Daily	Daily	Daily	Daily	Daily
Monthly dummies	Yes	Yes	No	No	No	No	No	No
Within period flexible trend	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	109,459	109,459	358,825	358,825	385,370	385,370	382,968	382,968
Number of firms	1,192	1,192	1,277	1,277	1,284	1,284	1,273	1,273
R-squared	0.03	0.13	0.01	0.10	0.00	0.00	0.01	0.01