The Design of a Best Execution Market

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Abstract

The notion of best execution on securities markets is manifold. Best execution has different meanings to different market participants, therefore, it is difficult to find a unique market structure that meets this requirements for all the participants.

Traditional market structures are either static or flexible, meaning that an individual market participant has no influence regarding the concrete market structure's characteristics, like e. g. the price discovery mechanism, trading frequency or the market transparency.

Focussing on customer orientation, we propose a new type of market structure: the dynamic market model, where participants individually choose the characteristics of the market structure for each transaction they perform. Furthermore, this paper offers an approach to design dynamic market models from scratch. We briefly sketch the necessary steps towards a dynamic market model.

Finally, we present AMTRAS; the prototype of an electronic trading system that was conceived and implemented following the aforementioned approach. AMTRAS is an software-agent based bond trading system designed for the need of institutional investors. It implements a dynamic market model, a sophisticated product- and partner matching scheme as well as an innovative price discovery approach.

The Design of a Best Execution Market

The term best execution is used by the New York Stock Exchange (NYSE) since the 1970ies (Levitt 1999) and most scientists in the field of finance do agree that the notion of best execution does *not* attribute to one single factor, but its common use is in many cases inconsistent and it often refers to “best price“ only.

In our opinion best execution depends on a *wide variety* of elements and has to be analyzed from *two different perspectives*:

i. The investor’s perspective:

Each investor (respectively each group of investors with homogeneous demands) has her own understanding of best execution depending on a huge number of possible *demand or execution factors* like speed, price, market impact etc. The relevance of each single element’s contribution to the goal of best execution thereby differs depending on the individual demands of the investor regarding the product to be traded.

ii. The market’s design perspective:

Even though the discussion of best execution often targets the question of *broker’s* responsibility to ensure execution quality for their clients (see Levitt 1999), we do follow Macey and O’Hara taking a closer look upon the question of market design: “best execution must be considered within the context of market structure“ (Macey and O’Hara 1997, p. 220). Instead of defining best execution as a question of order routing, we consider it to be a question of customer orientation in market design. As “each trading structure provides a different vector of execution attributes and services a different clientele“(Macey and O’Hara

1997, p 220) designing *one* market structure that allows best execution for a number of investors remains a question of high complexity and unseldom huge compromises.

insert figure 1 around here

This article deals with this circumstances and introduces the idea of *dynamic market structures* as a concept to more customer orientation in the design of markets.

Figure 1 illustrates how market structures have to be designed regarding their *structural features* (like transparency, price discovery etc.) to meet investor's demands – represented in special execution factors – to generate a best execution situation.

This paper is organized as follows. First, we will illustrate demand characteristics respectively *execution factors* of different investor groups and the resulting complexity implied in the design of markets in section one. The idea of *dynamic market structures* – the individual configuration of the market's *structural features* – will be presented in section two and illustrated by a research prototype that was implemented as a *proof of concept* in chapter three. The last chapter will outline some conclusive remarks and address future research of transferring the aforementioned approaches to commodities markets as well.

1. The Matrix of Best Execution

Most scientists and practitioners in the field of finance agree that the notion of best execution does not attribute to one single factor, like the execution price. Rather than that, it seems more likely that best execution depends on a wide variety of elements. In this section we examine some of these factors and show that their relevance differs with respect to different investor groups: Best execution factors that are of major importance for a fund manager might not be as relevant for an individual investor. Furthermore, the same is true for the diversity of traded assets: Best execution factors in stock trading clearly differ from best execution factors in bond or derivatives markets.

In the following subsection we elaborate the best execution factors.

1.1. Best Execution Factors

Although the literature does not provide an encyclopedic list of factors, a few articles are helpful to identify the most important ones. Wagner and Edwards (1993) keep their analysis on cost arguments: They summarize all the factors within trading costs, that being liquidity costs, transaction costs like commission, price impact, timing and opportunity cost. Other authors, like Macey and O'Hara (1997, p. 189) address the timing of trades, the trading mechanism, the commission and the trading strategy as relevant factors besides the execution price. The Securities and Exchange Commission (SEC 1977) identified following elements as determinants for best execution: price, order size, the securities trading characteristics, the availability of information affecting investors decisions and appropriate information technology (IT) possibilities to process this information, access to different markets and the costs and difficulty associated with achieving an execution. Similarly, NYSE's recent Market Structure Report (NYSE 2000, p. 14) identifies the execution price, the opportunity for price improvement, the execution speed, the market impact of execution, the certainty and the cost of execution as relevant attributes.

Though it is nearly impossible to list all the relevant best execution factors, the factors stated above may limit the amount of all possible factors to what we think might be very important ones. Since the aim of this paper is not the quest for the ultimate best execution factors-list, we exemplarily pick some of them and show why they might be of importance for a particular market participant.

1.2. Market Participants and Best Execution

The concept of best execution can only be applied with consideration of the needs of different market participants. Institutional investors have different needs than individual investors. Traders have different requirements than securities dealers. But even within these groups there is fragmentation regarding their requirements, e. g. depending on a specific situation. For instance, institutional investors can be divided into following subcategories (each of to be described below):

- Banks trading for their own account,
- funds,
- firms and
- fiscal agents.

Banks trading for their own account can be divided into short- and long term traders, respectively. Short term traders, especially speculators, try to benefit from price fluctuations that appear intraday. They do not prefer to hold positions over a long period of time. Another group of short termed players are arbitrageurs, they profit from price differences across different markets. Both the speculators and arbitrageurs prefer access to different markets combined with *fast execution* and *low commissions*. Long term institutional investors hold relatively large positions for a longer time span, so that *order size* connected with an appropriate *trading mechanism* might be of greater importance than e. g. the need for *immediate execution*.

Funds manage assets on behalf of their customers. Pension funds typically invest in low risk stocks and bonds, whereas mutual funds cover a wide variety of investment possibilities, ranging from conservative funds to high-risk growth funds containing, e. g. IT and biotech stocks. Depending on the clientele and the kind of the managed securities the requirements towards best execution are inhomogeneous: Some funds shift frequently from one security to another, others do not. Therefore, the former require *low commissions* and a discriminating trading strategy, whereas these factors do not play a major role for the latter.

Firms like insurance agencies or (multinational) corporations with appropriate cash management systems might want to temporarily invest their excess liquidity in securities. These investors are primarily interested in *fast execution* without any major or unexpected difficulties, especially when liquidity is needed again in the core business.

Companies active on the mergers and acquisitions (M&A) market, i. e. corporations intending to acquire other firms in part or as whole through the equity market. These, so called takeover operations may be either friendly or hostile, once again imposing different requirements towards best execution: A friendly takeover might be just as simple like any block transaction as seen on the upstairs market of the NYSE or – in major cases – so difficult that its arrangement needs the subtle skills of investment bankers. However, a hostile attempt to acquire the majority of a firm may even be more complex. Besides the consideration of *order impact*, the attacking firm might need a trading strategy, which implies to remain *anonymous* until the relevant disclosure obligations are accomplished.

National banks acting as fiscal agents with special tasks concerning government bonds or foreign exchange issues. The Deutsche Bundesbank, e. g., has the obligation to perform market-smoothing operations of exchange-traded Federal debt securities in order to ensure trading at all times, also in larger amounts, and at market prices (Deutsche Bundesbank 1995, pp. 59-60). Furthermore, under certain conditions an intervention in the foreign exchange market is possible. The Bundesbank's goal is therefore not profit maximization but market influence. So its requirements towards best execution is not primarily the *price* nor the *transaction costs* but the *speed of information dissemination* about the market entry of *the* major player.

Besides these, institutional investors, there are individual investors involved in the market processes. Regarding the tremendous growth of online brokerage accounts, these investors will have to be taken into account while designing tomorrows financial markets (see Weinhardt and Gomber and Holtmann 2000, p. 826). They, too, have different needs regarding best execution:

<u>Funds investors</u> bear the agency costs of the principal-agent relationship between them and the funds manager. There are many conceivable sources for this cost: First, investors are usually interested in *low commissions*, which can be attained by minimizing shifts between stocks in the fund. The funds manager, on the other hand, is interested in frequent fund restructuring in order to charge fees to his customer. Second, funds pool liquidity. That means that a fund has large financial means to its manager's disposal. This makes nearly every transaction a block transaction with a corresponding price impact. An individual investor wouldn't face this impact if she retailed the corresponding stock herself. One possible way to avoid such a *market impact* might be to convince the market that this block trade is liquidity (i. e. not informational) motivated. Similarly to *sunshine trading* (Grossmann 1988), there could be a chance to lower the *price impact* due to disclosing the trader's (here the fund's) identity to the market, given a trader's good reputation. One possible way to achieve this might be to display the trader's name in the open limit order book. In contrast to sunshine

trading, this trade wouldn't have to be announced some time span before – the decision of identity disclosure is at a traders own behalf *at* the moment of order specification. This possibility, however, requires an innovative market design; one that allows market participants to individually decide upon their degree of *anonymity* in the trading process. The same holds for institutional investors, e. g. for fiscal agents.

Increasing IT possibilities make new brokerage services possible. In those *dark ages* before the merits of online brokerage, retail investors were at their brokers mercy: Every single order had to pass the broker's desk, relevant financial information – like up-to-date quotes, the market situation or a trader's order status – was only to be obtained through the broker. Despite the broker's obligation to *best execute* a customer's order, there was neither a guarantee about it nor a reliable or feasible monitoring possibility for the investor. All of that changed with the advent of online brokerage: A contemporary online broker just *routes* the customer's order to any desired trading place. The whole process just takes seconds due to the speed and reliability of the (competitive) online broker's IT infrastructure. Now, it is at a customer's own responsibility to check the validity of her order and to monitor it's status on the market; furthermore the customer decides – based on her preferred execution factors – where to trade her securities.

Due to the automation of the transaction processes,[i] transaction costs decrease dramatically, especially in the retail market.[ii] Besides that, online brokers offer a wide variety of additional services, like websites with extensive market information, chatrooms for investors etc. All of these arguments contribute to customers clearly preferring online brokerage to conventional brokerage. This observation is actually supported from a survey conducted by the Association of German Banks: The number of online brokerage accounts doubles every year (Bundesverband Deutscher Banken 1999). Despite all the advantages of online brokerage, there is still a significant number of customers who prefer traditional brokerage services. There may be several causes for that, starting from the lack of either a computer with internet access or the knowledge to operate one, the general reluctance to new technology (especially computers) or even a physical handicap to utilize a computer, psychological barriers like fear of committing mistakes of grave consequence while ordering a security online, up to the simple preference to contact the broker personally.

Individual investors differ also regarding the amount of brokerage services. Especially online brokerage customers vary extremely regarding trade frequency and volume (Abell 1998). For instance *ConSors*, a major European online broker, defines *star traders* as customers with more than 100 executed orders per year and a securities account volume of more than 50.000 € (ConSors 2000). This group of investors is particularly interested in *fast and accurate market information*, *low commissions* and the possibility of day trading, while the more typical retail trader – e. g. an employee with moderate income who places his orders at home after work for the next trading day – prefers a convenient and reliable transaction: For those traders, *convenience* might be of greater importance than to get a *price* that is just one tick better.

Best execution isn't just relevant for securities traders: In a quote market there are dealers who are obliged to submit quotes, i. e. bid and ask orders to the market. Their main profit source is the spread, so dealers are commonly interested in maintaining a balanced position throughout the trading day (O'Hara 1995, p. 51). In trading with informed traders, i. e. traders with superior information about the assets fair value, dealers regularly suffer losses. So from a dealers point of view, the requirements to best execution would be the quotation of *indicative offers* instead of obligatory orders. Another mechanism to restrain informed trading might be to design *transparent markets*, like the aforementioned possibility for liquidity traders to disclose their identity to a dealer. Another point regards the losses market participants might suffer by certain technological improvements that are intentionally introduced to improve trading process and contribute to best execution. One of these issues is Nasdaq's SOES (small order execution system), that was introduced following the crash of 1987. It was intended to give retail investors *fast access* to the market, particularly at times of stress. SOES had also negative implications to the market because it enabled professional market participants (so called *SOES bandits*) to identify and hit the stale quotes of other – so called *SOESed* – dealers (Schwartz 1998, p. 144). From the SOESed dealer's point of view this generates another requirement to best execution: A mechanism, that *automatically eliminates stale quotes* from the system.

Many other issues, concerning both traders and dealers, apply to the notion of best execution when agency problems, like e. g. dual capacity trading and front running, are introduced.

We have shown that best execution is an indistinct matter: Each clientele has different requirements towards best execution factors. This can be depicted with the Matrix of Best Execution as shown in figure 2. On the horizontal axis we have drawn the different clienteles, while the vertical axis represents various best execution factors. The shading of fields indicates the relevance of a factor to a market participant: the darker the shade, the more relevant the factor is to that particular investor. For instance, the factor *fast execution* is of major relevance to a *speculator*, while the factor *access to different markets* is of medium relevance to *insurance* companies. However, if a field is unshaded, this factor does provide only little relevance (if any) to the specific group. An example might be the factor *low commissions*, that doesn't seem to play a role for fiscal agents.

insert figure 2 around here

This figure, though, serves just as an illustration. It is far away of being a complete model. We are aware that it is not a trivial matter to accurately identify 1) all the market participants, 2) the relevant factors and 3) to weight the factors according to an investors need as we have done it. However, for the purpose of this paper – to propose how markets may be constructed for the needs of different market participants – our presentation serves as a good approximation of the real world.

1.3. Products and Best Execution

Now, lets make things more complex. Until now, we just spoke generally about securities trading. In a next step, it is conceivable to introduce different products to the concept of best execution. To an investor, the importance of a best execution factor varies regarding the products traded. For instance, an *arbitrageur* has different requirements to the factor *fast execution* when he trades blue chip stocks on the one hand or illiquid bonds on the other.

Just like for the different factors and their clientele, one can find many different categories and subcategories of traded products; each of having different influences to the Matrix of Best Execution. This leads to the introduction of a third dimension to the matrix: the dimension *Products*, turning the rectangle into a cuboid. However, the aim of this paper is not to identify these issues completely but to show how markets might be designed in such a manner that all three Matrix' dimensions are considered.

2. The Design of Best Execution Markets

The analysis of the previous section points out the ambiguities in the meaning of economic best execution. Yet, we elaborate on the design of markets that allows investors to *configure individually* the market according to what they assume to be best execution. As we demonstrate, this goal hinges upon the underlying market model. In this chapter, therefore, we pick-up the issue of market models. In particular, we propose a specific type of market model which we consider promising to approach our goal of best execution. In order to implement this in practice, we suggest a procedure that is generally apt to stress customer orientation throughout the process of market design.

2.1. Traditional Market Models

In literature the notion of a market model – often dubbed as market structure – has been controversially discussed for a long time. The German Stock exchange, for instance, defines the market model as *“the mechanism of matching orders to trades in the exchange trading system“* (Deutsche Börse 2000, p. 7). This narrow definition, however, refers only to securities that are traded on stock exchanges and comprises neither the off-market securities trading nor commodity trading as a whole.

A more comprehensive approach tends to the structural features of markets such as price discovery, trading frequency etc. (see Gomber 2000, p. 10-11). Each of the features can have several characteristics as figure 3 illustrates.[iii]

insert figure 3 around here

The market maker principle employed by the Nasdaq until 1997 is an example for one possible characteristic of the feature ”price discovery“, whereas most of the Electronic Communication Networks (ECN), e. g. Island, rely on continuous auctions (Island 2000). Accordingly, the configuration of the structural features of the market determines the concrete market model. However, these characteristics are not necessarily fixed over time. Recall that trading on the NYSE actually involves two different trading mechanisms: A call auction is used to open trading, whereas a continuous auction is applied until the end of the trading day (O'Hara 1995, p. 10, 179). On the other hand there are cases where these characteristics are not subject to change. This case, for instance, applied at the Nasdaq before the Order handling rules (OHR) were introduced. Until then, only the market maker principle was employed: dealers offered their quotes, traders hit them.[iv] (see Huang. and Stoll 1996, p. 318). From this examples it becomes obvious that not only the combination of the characteristics but also an additional determinant – the *degree of the characteristic's variability* – is crucial for the market model. Following this insight, market models can be distinguished into three distinct categories, being

- static,
- flexible and
- dynamic market models.

A static market model denotes the case where exogenous factors (i. e. factors independent from the market occurrences) determine the structural features' characteristics (see Budimir and Gomber 1999, p. 255). An example will be helpful for comprehension: Let's take a look at the feature ”price discovery“ at the aforementioned ECN Island. Here we have only *one* characterization of the feature price discovery, that being a *continuous double auction*. The trading rules – i. e. to implement just one price discovery mechanism – are set independent from the events taking place on the market.

Beside this trivial case the classification of market models that facilitate a change of the characteristics is more sophisticated. The NYSE provides a vivid example of a static market model. The exogenous factor trading time determines the trading mechanism: At the *beginning* of the trading day there is a call auction. *After* that, trading takes place using a continuous auction.

A flexible market model denotes the case where endogenous factors – i. e. factors that are the result of special market events – determine the characteristics of the market structure (see Budimir and Gomber 1999, p. 256). The volatility interruption of the Xetra[v] system appears to be an appropriate example. It occurs whenever the next execution price lies outside a specified price range. As a consequence, continuous trading is instantaneously interrupted and a call auction is initiated (Deutsche Börse 2000).

However, both static and flexible market models cannot meet the heterogeneous requirements of all the different market participants. Applied to the case of securities markets, the ability to fulfil investor's needs is crucial for the success of both stock exchanges and ECNs, respectively. Yet, stock exchanges have traditionally adopted either flexible or static market models that are incapable of meeting all the investors demands. Their services usually comprise transactions designed for the "medium investor". The lack of flexibility is a major reason why a variety of ECNs have emerged which seek to offer specific transaction services for special niches[vi] (see Gomber 2000, p. 58). This shortcoming of traditional market models leads us to the third category, namely to dynamic market models.

2.2. Dynamic Market Models as a Solution

A dynamic market model denotes the case where market participants themselves choose market structure's characteristics for each transaction. This concept aims to provide the market participants with a toolbox that enables them to select the most proper trading vehicle according to their individual preferences (see Gomber 2000, p. 99). Schwartz uses a resembling metaphor: "*As with any shopping mall, the trader (customer), when entering the* *market, would select the specific modality (store) that best suits his or her needs, given the size of the order, the trading characteristics of the stock, and that customer's desire to trade quickly or willingness to be patient"* (Schwartz 1998, p. 149). The multiple-platform market structure proposed by the NYSE (NYSE 2000) exemplifies the concept of dynamic market models:

According to the NYSE report[vii], the multiple-platform market structure offers investors two mechanisms of price discovery. The investor can either select a floor based agency auction or an automatic execution through an electronic trading system. The floor based agency auction of the NYSE traditionally embodies a high concentration of liquidity[viii] due to the large number of market participants. The investors on the NYSE floor are represented by the so-called crowd, i. e. brokers that come to the post to seek an execution. The competition among the crowd leads to an adequate price discovery. On the other hand, an automatic execution especially takes the demand for execution speed into account. Both trading mechanisms and market structures are left to fair competition but within the bounds of a single marketplace (NYSE 2000, p. 11)[ix]. The dynamic market model approach, however, is even more far-reaching, since it permits a tailor-made compilation of all features.

Overall, dynamic market models appear to be superior to traditional market models since they allow the *investors* to choose the most benefiting trading vehicle according to their preferences (see section 1). The choice of the structural features, however, implies that the trading system has to verify the mutual interoperability of the chosen market models before two corresponding orders can match.[x] The trade may take place only if their structural features coincide. This market model clearly divides the market into several market segments. Each of the market segments is distinguished by a different degree of market transparency, price discovery etc. One might discern that this configuration will reduce the liquidity of the entire market: If, at one hand, we have a buyer who prefers a continuous double auction as price discovery mechanism for his order and, at the other hand, there is a seller who prefers a call auction, there will be no matching at all – even if all the other order parameters match.[xi] This argument can be softened regarding the desire for alternative market models that finally led to the evolvement of ECNs. Hence, the provision of a dynamic market model does not additionally defragment the market. It rather concentrates distinct transaction orders in one marketplace (see Gomber 2000, p. 159).

NYSE's push forward suggesting a multiple-platform market model clearly breaks with the tradition of static and flexible market models. Due to the dynamic market model's immanent advantages, the NYSE approach is considered promising.

A market that embodies a dynamic market model, however, still cannot provide the full range of best execution demanded by the full range of investors. Nonetheless, such a market is in the position to meet the diverse demands of a predetermined investor group and can be – in a sense – upgraded in a successive manner.

The implementation of a dynamic market model from scratch is rather difficult. Different market segments require the provision of different structural features. The selection of the predetermined investor group thus has an impact on the adequate market model. To simplify the designing process, we suggest to comply with the following procedure (see figure 4).

insert figure 4 around here

As a first step, the product selection divides the total market into market segments and thereby reduces complexity. While the demands of all investors are multifaceted, partly even inconsistent with each other, the demands of investors pertaining to the same market segment may have at least quasi-homogeneous demands. Secondly, the various market participants have to be identified. In the subsequent step, surveys performed on the identified investor groups yield the demands with respect to best execution. In this context the influence of customs and practices on the demand must be recognized. Note that – after step 3 – we are able to fill out a slice of the three-dimensional Matrix of Best Execution. In step 4, the design of the structural attributes, mainly the price discovery mechanisms, has to be attuned to the demands in order to achieve a high level of customer orientation. Finally, experimental tests have to be performed in order to get feedback from the participants, whether best execution transactions could be achieved or not. In each of the phases it is allowed to step back to a prior one, to reconfigure or enhance the model.

The stated arguments presented in this chapter gave rise to the implementation of a trading system which we introduce in the following chapter. Moreover, we briefly sketch the designing process of the trading system exemplifying the suggested procedure.

3. The Implementation of a Dynamic Market Model

The prototype AMTRAS[xii] (**A**gent **M**ediated **Tra**ding **S**ystem) was developed as an Internet trading system designated for institutional bond traders (see Weinhardt and Gomber 1999). The project primarily aimed at developing a trading system that epitomizes a dynamic market model as a proof of concept. The German bond market was considered valuable to investigate because most of the bond trades in Germany are negotiated face-to-face via telephone. Neither exchanges nor electronic bond trading systems like Xetra are utilized by the market participants because the existing market structures do not satisfy their heterogeneous needs. Market data supports this observation: Only 10% of the trades are conducted via exchanges, the portion traded on electronic systems is even smaller (see Weinhardt and Gomber 1999,

p. 1). Evidently, this phenomenon reveals weaknesses of electronic trading systems adopting traditional market models. An attempt to establish a successful bond trading system must particularly fulfil the needs of the most important investor group, namely the institutional investors who prevail bond trading (step 2 from the market design process described in chapter 2.2).

Within the scope of the research project a survey was performed on German institutional investors in order to extract their requirements for this specific market (step 3). According to the survey, best execution comprises the following sections[xiii]:

- Most of the institutional investors prefer *anonymous trading* utilities. This aspect favors the innovative use of electronic trading systems.

- The authorization of a broker to execute trades always bears the risk of intermediation. The broker can take advantage of the additional information gained by his appointment infringing his authority. The *avoidance of front-running* is accordingly one urgent need of institutional investors.

- Overall, the investors regard the *degree of transparency* to be extremely important. The degree assuring best execution is though controversial.

- Analogous to the previous aspect the demand for *immediacy* of a transaction is controversial. This controversy stems from the trade-off between immediacy and *transaction costs*[xiv].

- Liquidity clearly remains the central aspect of markets. However, liquidity is rather the result of a market's ability to satisfy the needs of the investors. The design of the market model can at most indirectly influence the liquidity. Only if all the influenceable needs of the investors are met, order flow can be accrued by adding additional liquidity to the market[xv].

The results of the survey yield beside homogeneous requirements for the dedicated investor group also heterogeneous requirements amongst them for an electronic bond trading system. This obviously requires the application of *alternative* trading vehicles. At this point, we desist from the description of the fourth step[xvi] in favor of depicting the system.

Within the fifth step, the system is implemented. Since it is impossible to recognize all the effects the new trading system might have to the market – for instance the possibility to hit stale quotes with the SOES introduction at the Nasdaq –, it is advisable to use the techniques of experimental economics to perform laboratory tests before its final release. The major challenge within this step is to find an appropriate experimental design, one that depicts the real-world as good as possible within the realms of the experimental environment. The findings of the experimental tests can be used to improve the system as well as to supply new insights to the other steps in the market design process.

The system AMTRAS has the capability of meeting investors‘ heterogeneous requirements. As aforementioned, a dynamic market model forms the core of the system. The trader can individually configure the structural feature’s characteristics *degree of market transparency*, *price discovery mechanism* and *degree of order obligation*. This explicitly takes the investor’s contradictory requirements into account. The selection of the desired market model hence grants the flexibility which is comparable with the flexibility in the existing off-exchange markets (see Gomber 2000, p. 158).

The electronic trading process implemented in AMTRAS is represented by a multidimensional negotiation protocol and quite differs from the currently existing electronic trading systems. The negotiation sequentially pursues three distinct stages. All stages together determine the terms of the transaction.

The trader initiates the first stage – the so-called product matching – by submitting his order specification. A special feature of the AMTRAS system is the possibility of fuzzy order specification in order to leave room for the negotiating (see Weinhardt and Gomber 1999, p. 4). This stresses the integrative character of the negotiation protocol[xvii]. At this stage the system starts searching for a corresponding order.

On success (i. e. when a matching product is found) the partner matching – the second stage – is triggered. This stage accounts for the counterparty risk that particularly aggravates off-exchange trades. The absence of a market surveillance always bears the risk that one party fails to meet it's obligations. In AMTRAS this issue is addressed in such a manner that a trader may explicitly rule out to negotiate with certain other traders he individually determined during order specification. For example, a trader might specify to contract only with domestic partners, or with an *élite* he always does business with. By doing so the counterparty risk is not completely eliminated but to a certain extent alleviated (see Edwards, 1995). Note that the order of performing steps one and two is not crucial; the same result would have been accomplished if the system first identified the relevant partners, in order to perform a product search in stage two. This is why the first two stages are depicted as they are in figure 5.

insert figure 5 around here

After successful partner matching, subsequent stage encompasses the price discovery. At present, AMTRAS supports four distinct mechanisms, as figure 5 illustrates. These are

- manual price discovery, meaning that after a successful product- and partner matching phase a trader gets notified by the system in such a way that she gets a list of potential trading partners and corresponding products. Now, she can call her counterpart on the phone to conduct further negotiations conventionally.

- bi- or multilateral bargaining, that being the possibility of electronically supported interactive bargaining between trading partners. In AMTRAS, there is a possibility to bargain both via an integrated chat system and a graphical user interface that depicts a partner's trading strategy (see Gomber 2000, p. 155-158).

- AMTRAS auction, i. e. a sort of single-sided Vickrey auction that was tailor-made for the needs of institutional bond market participants. It should grant efficiency in that sense that every investor will offer according to her real preferences[xviii].

- combined, meaning that the three aforementioned price discovery mechanisms can be combined in order to minimize fragmentation effects.

As we previously stated, the needs of the traders may be heterogeneous. The dynamic market model provides various price mechanisms being apt to guarantee best execution individually.

The depicted multidimensional negotiation is realized by the use of software agents[xix]. Software agents adopt the preferences and strategies of their human counterparts and pursue them on behalf of the trader in an appropriate manner. This feature eliminates the risk of front-running because the software agent's goals should always be in accordance with the principal's. Moreover, the interposition of agents conforms with the demand for anonymity (see Weinhardt, Gomber and Holtmann 2000, p. 830).

4. Conclusion

In this article we present an approach to more customer orientation in (financial) market design. We introduce the best execution matrix illustrating the complexity in designing markets when heterogeneous demands concerning the best execution factors are given through different investor groups.

The idea of dynamic market models is illustrated giving the opportunity to combine heterogeneous structural features into one market structure allowing an individual compilation of factors by each investor. Dynamic market models thereby increase customer orientation and the possibility to achieve best execution transactions by providing a toolbox to the investors. We suggest a five step approach in creating customer oriented market designs. Therefore, the brief description of the first five steps of the process towards a best execution market design for the German bond trading market (AMTRAS) is used to point out our before mentioned statements using innovative price discovery mechanisms, i. e. the possibility of bi- and multilateral negotiations that could be delegated to software agents.

Current and future research targets mainly the following aspects:

i. We are currently designing and performing experimental tests with the AMTRAS system (phase 5) to ensure customer satisfaction and to enhance system's capabilities.

ii. Additionally, we are widening our existing approach towards additional financial products. Taking the growing relevance of private investors into account (see Weinhardt and Gomber and Holtmann 2000, p. 826), we do focus on stock and bond market designs, filling the structural features with innovative solutions.

iii. As we do not consider the before mentioned aspects regarding the design of best execution markets to be valid for financial markets exclusively, we are currently moving ahead on the product dimension in our best execution matrix and are transferring our approaches towards *energy*- (see Strecker 2000) and other kinds of *commodity markets.*

As in current B2B (Business-to-Business) or B2C (Business-to-Customer) markets respectively exchanges, market structures are static and the price discovery is reduced to quite simple protocols – namely auctions (see e. g. Ströbel 1999), we do think that our concepts have to be transferred to *other than financial markets* as well.

The transfer of financial markets' approaches – targeting price discovery as well as market microstructure theory at a whole – towards the trading of commodities of all kinds is promising to overcome current limitations and to attain time-to-market and quality advantages for innovative players in designing tomorrows markets. Actually players are recognizing the lack of existing markets as they state:

> "Hybrid models allow existing participants to connect and interact in even more ways, providing the flexibility that real worlds markets demand and spawning more transactions within the marketplace. Because each mechanism attacks a different business inefficiency, the market that provides the full range of trading mechanisms will most optimally serve its buying and selling communities, as well as create complementary revenue streams for itself."
>
> (see IDAPTA 2000)

A lot of effort has to be made to transfer existing concepts and approaches to build financial as well as generic markets following the best execution idea.

Notes

[i] According to Picot et. al., the transaction process consists of the phases information, order routing, price discovery, clearing and settlement (see Picot et al. 1995).

[ii] While the commission for a small order (volume below 1,000 Euro [€]) placed at a German conventional broker totals to about 25 €, the same order is charged with 10 € by an online broker.

[iii] There are, of course, numerous structural features not shown in figure 3. However, our intention is just to illustrate the concept. For a complete analysis see Gomber (2000).

[iv] In 1997, the Nasdaq implemented a hybrid market by adopting new OHR (SEC, http://www.sec.gov/rules/final/34-38110.txt). The *limit order display rule* requires a market maker to publicly display a trader's order if it is inside the spread. These orders can be executed without the interposition of a market maker (Nasdaq, http://www.nasdaq.com/about/oh_rules.stm).

[v] The electronic trading system Xetra (E**x**change **E**lectronic **Tra**ding) was introduced in 1997 by the Deutsche Börse. It's predecessor was the system IBIS (**I**ntegriertes **B**örsenhandels- und **I**nformations**s**ystem).

[vi] "*Historically, a small investor would have to pay a penalty in terms of higher proportion of cost in order to get a small trade executed on the New York Stock Exchange. Nowadays, however, the shift in technology means that small order processing can be relatively profitable and the ECNs are reaping the reward*" (Langton 1999).

[vii] The NYSE has recognized that the technical development requires amendments concerning their market structure in order to provide their customers the best executions in NYSE-listed stocks. The committee of public directors of the NYSE, who has been appointed to analyze the NYSE market structure, governance and ownership, motivates in their report the deployment of technological advances and regulatory changes as long as they serve the Best Execution Principle (NYSE 2000, p. 14). At first, the inquiry of the market structure leads among others to recommend the implementation of a multiple-platform market structure.

[viii] In this context liquidity refers to the ability of market participants to trade immediately at reasonable prices. Liquidity spans the following dimensions: depth, breadth, resiliency (see Schwartz 1991, p. 127).

[ix] According to the NYSE report the multiple-platform market structure generates a basis for continuous adaptation where the outcome is uncertain (NYSE 2000, p. 19).

[x] Therefore new protocols or algorithms for matching have to be implemented; besides the trivial case of single-item matching – like e. g. the price – successive or parallel multi-attribute matching has to be implemented (for more information to the topic of *electronic negotiations* refer to http://enegotiations.wu-wien.ac.at/).

[xi] There are other structural features' characteristics that are not that essential, e. g. anonymity. If one player reveals his identity to the market while his trading partner does not, the order can still be executed.

[xii] The project was a joint venture of the Chair for Information Systems at the faculty of Economics, Giessen University, Germany (http://www-wi.wirtschaft.uni-giessen.de) in association with the *Deutsche Börse Group (http://www.exchange.de)*, *Compaq Germany* (http://www.compaq.de*)* (formerly *Digital Equipment*) and the German software company *living systems,* Donaueschingen *(http://www.living-systems.com).*

[xiii] A comprehensive description of the survey's results is given by Gomber (2000, p. 79-85).

[xiv] *"However, higher direct costs (i. e. market impact, bid-ask spreads, commissions and other transaction costs) are generally incurred when fast execution is obtained"* (Economides and Schwartz 1995, p. 24).

[xv] At this point we refer to a survey of the international Federation of Stock exchanges: "*Often there is a ‚chicken and egg' situation: i.e. if you look at liquidity and another quality factor it is hard to define what causes what. Liquidity creates liquidity*"(see Meier 1998, p. 13).

[xvi] Instead we refer to the article Weinhardt and Gomber (1999) for a detailed description.

[xvii] Negotiations are traditionally distinguished in either integrative or distributive types (see Walton and McKersie, 1965). Distributive types denote "win-lose" negotiations. One party can only gain at the other party's expense. Integrative negotiations on the other hand denote "win-win" negotiations. Kersten and Noronha characterize this type of negotiation as follows: *"The parties attempt to expand the pie during the negotiation process"* (Kersten and Noronha, 1999).

[xviii] Please refer to http://enegotiations.wu-wien.ac.at/ for a detailed description of negotiation protocols' evaluation criteria.

[xix] Software agents are "*computational systems that inhabit some complex dynamic environment, sense and act autonomously in this environment, and by doing so realize a set of goals or tasks for which they are designed*" (Maes 1994, p. 135-162).

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Figures

Figure 1

Figure 1: Perspectives of Best Execution Markets

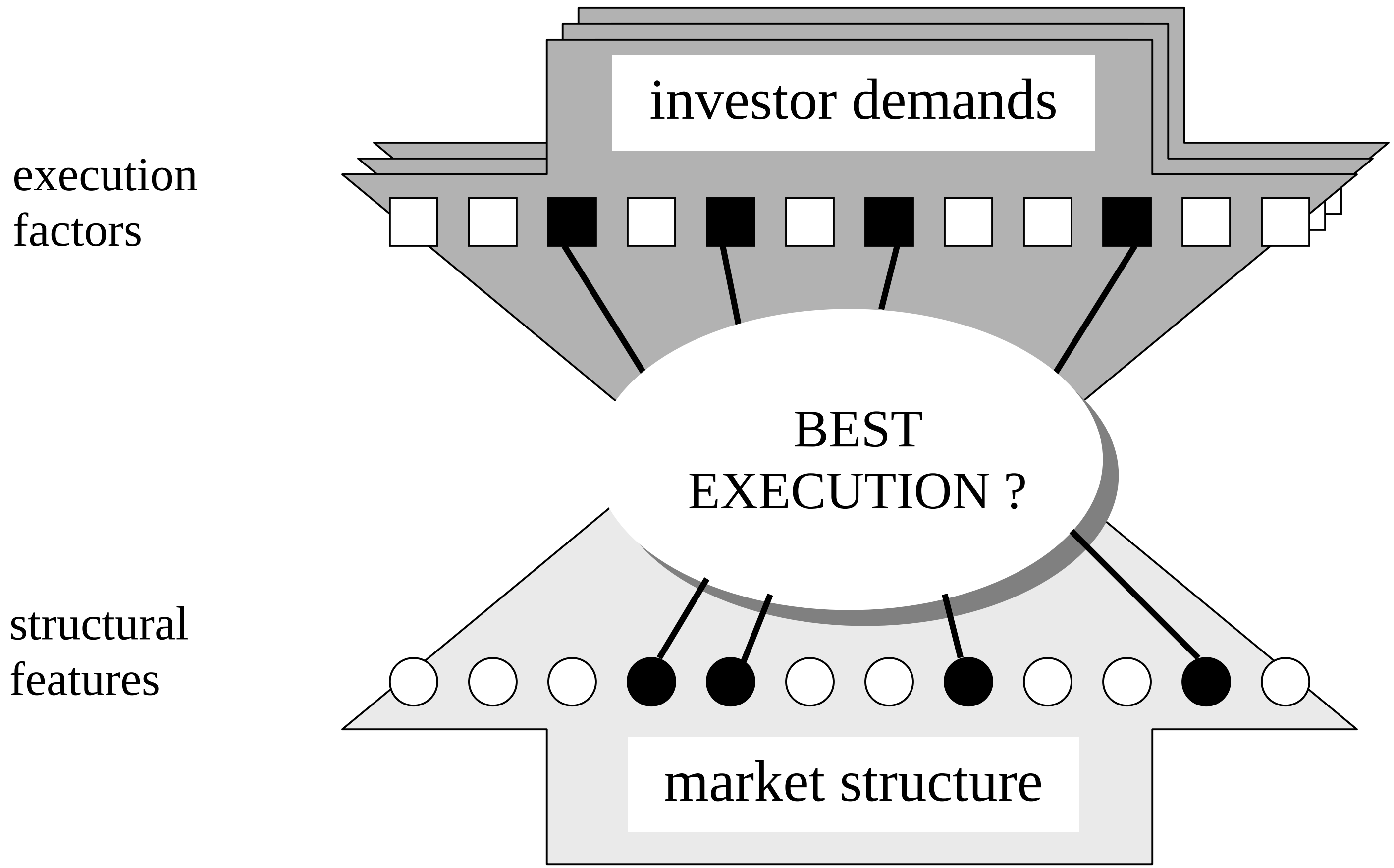

Figure 2

Figure 2: The Matrix of Best Execution

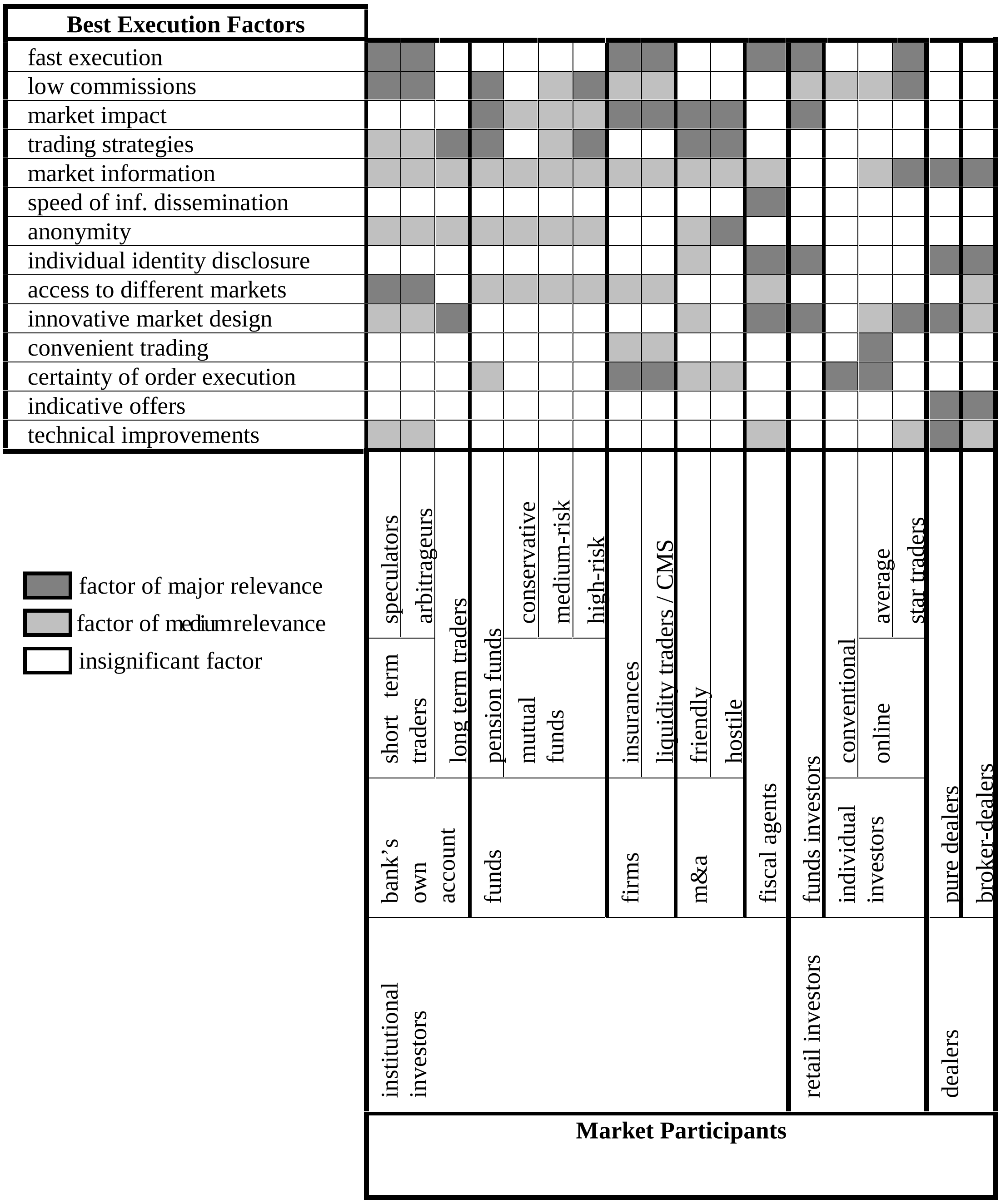

Figure 3

Figure 3: Structural Features and their Characteristics

<table>
<tr><th>Structural Features</th><th colspan="6">Characteristics</th></tr>
<tr><td>price discovery</td><td colspan="2">auction market</td><td colspan="2">hybrid market</td><td colspan="2">dealer market</td></tr>
<tr><td>trading frequency</td><td colspan="3">continuous trading</td><td colspan="3">periodic (call) trading</td></tr>
<tr><td>degree of market transparency</td><td colspan="2">open orderbook</td><td colspan="2">display of best orders
x = { 1, 2, ... n }</td><td colspan="2">closed orderbook</td></tr>
<tr><td>obligation character of orders</td><td colspan="2">obligatory orders</td><td colspan="4">indicative orders</td></tr>
<tr><td>[...]</td><td colspan="3">[...]</td><td colspan="3">[...]</td></tr>
</table>

Figure 4

Figure 4: The Process of Market Design

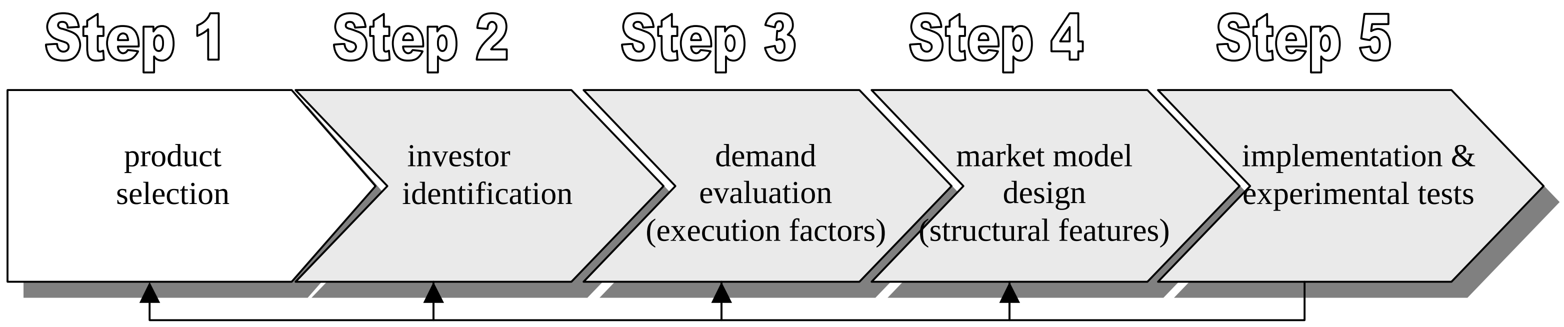

Figure 5

Figure 5: AMTRAS' Dynamic Market Model