

Intraday Margining of Central Counterparties: EU Practice and a Theoretical Evaluation of Benefits and Costs

Froukelien Wendt¹

Oversight Department
Payments Policy Division

De Nederlandsche Bank²

10 March 2006

Abstract

Intraday margin is a generally accepted risk management tool of central counterparties to cover increased risk exposure during the day. Central counterparties may call for intraday margin on a routine basis, but also in case of extreme price volatility or large changes in positions of clearing members. An increase in the use of a routine intraday margin call can be seen at central counterparties in the EU. Three central counterparties have recently introduced a routine intraday margin call and two central counterparties intend to do so. This article explores the concept of intraday margin and its role within the risk management framework of the central counterparty. In addition, an overview is given of the benefits, cost and side effects of intraday margining to the central counterparty, its clearing members and the capital market in general. Finally, the article examines the practice of intraday margining of central counterparties in the EU and the differences in intraday margining policies.

Keywords: Clearinghouse, Central counterparty, Replacement cost risk, Intraday margin

JEL classification: G29, G30

¹ Views expressed are those of the author and do not necessarily reflect official positions of De Nederlandsche Bank. While remaining responsible for any errors in this paper, the author would like to thank Ron Berndsen, Ernest van der Hout, Willem Huson and Martijn Lathouwers for useful remarks and suggestions.

² P.O. Box 98, 1000 AB Amsterdam, The Netherlands, e-mail: f.w.wendt@dnb.nl

1. Introduction

Central counterparties (CCPs) play a vital role in many European financial capital markets. They enhance the efficiency of securities clearing and settlement and redistribute the risk between market participants. However, the centralisation of risk within a CCP also increases systemic risk. Therefore supervisors³ are interested in the risk management framework of a CCP to ensure that a CCP is well protected against the default of a clearing member. Such a risk management framework typically consists of clearing margin, a clearing fund and own financial resources. Intraday margin provides central counterparties with an additional line of defence against a clearing member default. During the trading day the CCP has the possibility to request its clearing members to deposit additional collateral to mitigate risk from increased exposures. This paper examines three different types of intraday margin calls and evaluates the benefits and cost of intraday margining. Not only the positive consequences are taken into account, but also any negative effects. After all, a CCP only adds value to market participants if the benefits of the CCP outweigh the cost. Margin and clearing fund contributions pose substantial costs to clearing firms and so does an intraday margin call. In line with Recommendation for Securities Settlement Systems 4 (CPSS-IOSCO 2001) there should always be a proper balance between the greater protection for the CCP and the higher opportunity costs for its clearing members. The most important added value as well as the aim of the use of an intraday margin call is the risk reduction for the CCP. Intraday margin enables the CCP to quickly respond to an increased exposure, caused by large price changes or positions of clearing members. However, an intraday margin call may confront clearing members with additional cost, especially cost on the back office processing and collateral management. A side effect of intraday margining is the decreased need for a clearing fund, which might lead to an enhancement of the concept of 'the defaulter pays'. The paper ends with the results of a survey among CCPs in the EU. The survey examines the policy of CCPs in the EU with regard to intraday margining, especially whether CCPs have the authority to call for additional collateral during the day. In addition, the increased use of a routine intraday margin call is investigated, a practice known in the US for many years. This article may be used to evaluate the (introduction of an) intraday margin call within a CCP. Balancing the benefits and cost of intraday margining it is concluded that like a CCP is not the solution for every market, a routine intraday margin call is not the solution for every CCP.

Section 2 introduces the concept of intraday margin by describing the role of a CCP and the counterparty risk management framework of a typical CCP. Section 3 analyses the benefits and cost of the use of an intraday margin call for the CCP as well as for the clearing members and the capital market in general. Also the side effects of intraday margining are taken into account. Section 4 examines the different policies on intraday margin within European CCPs, using the three types of intraday margining. Section 5 finally concludes.

2 The Role of a CCP and its Counterparty Risk Management

The concept of intraday margin is introduced by a description of the role of the CCP and its risk management framework, since intraday margin is a specific risk mitigation tool to manage the replacement cost risk that a CCP is exposed to.

2.1 The role of a CCP

A CCP is a service provided by a clearing house. The role of a clearing house within the financial capital market is basically to determine the obligations that result from trading positions in financial assets (ECB 2001). In addition the clearing house can calculate the amount of securities which need to be settled and can process the trades to the settlement house. One way to settle obligations is on a gross basis, but often clearing houses net the debit and credit

³ This article uses the term supervisor to refer to prudential supervisors, overseers and security supervisors.

obligations. Netting between two counterparties results in one single net obligation between each pair of counterparties. This is called bilateral netting.

In addition to clearance – the term used for the determination of obligations - and settlement processing a clearing house can offer a CCP service. A CCP interposes itself between the buyer and the seller. The original legal relationship between the buyer and the seller is thus replaced by two new legal relationships – between the CCP and the buyer and between the CCP and the seller. The substitution of the original counterparty by a new contractual counterparty is called a contract novation (Ripatti 2004). The moment of novation is determined by the rules of the CCP. The CCP thus takes over the counterparty risk and guarantees the clearing and settlement of the trade. In practice there is an indirect relationship between the buyer and the CCP and the seller and the CCP, since trading members use intermediaries to represent their interests with the CCP. These intermediaries are usually called clearing members. CCPs may have a principal-to-principal relationship with its clearing members, which means that the CCP only retains a legal relationship with her clearing members and not with the clients of these clearing members.

In Europe most clearing houses offer a CCP service. Historically a CCP is only used in derivatives markets, because of the larger risk connected to derivatives during longer periods. The popularity of CCPs has recently spread to other markets, for example to cash markets. An important driver for the increased use of CCP services in cash markets is the increased use of electronic order books to match trades. The anonymity of the electronic order books complicates the risk management of market participants, because counterparty risk cannot be managed through their choice of counterparty. A CCP is a useful service to clear and settle anonymous trades, since the market participant can manage its counterparty risk towards the CCP. As such anonymity is maintained during the clearing and settlement process. A CCP was introduced for the Euronext cash markets during the late nineties, then still national markets. The London Stock Exchange together with the London Clearing House introduced a CCP in the London cash market in 2001. Deutsche Börse together with Eurex Clearing introduced a CCP for the German cash market in 2003. In general, the introduction of a CCP is followed by increased liquidity, smaller spreads and lower cost.

A CCP creates the possibility to net on a multilateral basis instead of a bilateral basis, since all debit and credit positions of a particular clearing member can be netted, resulting in only one single net position towards the CCP. As mentioned in the ECB (2001), many of the benefits of CCP clearing can be attributed to multilateral netting. Settlement costs are substantially reduced due to the reduction of the number of settlements. Other operational costs, like the back office cost of market participants, are reduced and straight-through-processing increases. Subsequent positive spin-offs for market participants are improved Return-on-Capital ratios and creditworthiness. The Basel II prudential framework may even further increase the use of CCPs, because multilateral netting requires less capital to cover operational risks.

Another major benefit of CCP clearing is that the CCP takes over the counterparty risk management of clearing members. Instead of many counterparties with different risk profiles, a clearing member only has to deal with one counterparty with relatively high credibility. As such the CCP redistributes the risk and lowers the counterparty credit risk in two ways. Multilateral netting reduces the total credit exposure of a market participant and the bilateral credit exposure towards the CCP is low.

As the CCP helps to sustain anonymity during the straight-through-process, a CCP contributes to increased liquidity and efficiency of capital markets, since anonymity provides for smaller spreads and increased liquidity.

Despite all the benefits mentioned above, a CCP is not necessarily the best solution for every market. By its nature a CCP concentrates the counterparty risk in a market, which may cause systemic disruptions in the case of a default of the CCP. As Recommendation 4 for SSS (CPSS-IOSCO 2001) states there are also costs connected to a CCP, which have to be carefully

weighted against its benefits. A CCP has to establish a robust risk management system that generally requires significant initial investments and ongoing expenses of its clearing members. If the potential benefits of a CCP do not outweigh this cost a CCP will not enhance market efficiency. BoE (1999) identifies criteria for determining whether a market is suitable for a CCP or not. For example, counterparty credit risk should be an unwanted by-product of trading activity. If market participants take risk deliberately to enhance returns the benefits of a CCP do not appeal to them. Also the scale of counterparty exposures should be material. If these criteria are not met a CCP might not be the best solution for this market. For example, the Finnish market has chosen not to introduce a CCP on their cash market (London Economics 2005). This market relies therefore on other means of controlling counterparty credit risk, such as counterparty exposure trading limits and collateralisation.

2.2 Typical Counterparty Risk Management Model of a CCP

Supervisors have an interest in ensuring a safe and sound clearing house, because a (major) disruption in a CCP may spread through the financial system, causing losses to its participants and threatening financial stability. In the case of links between CCPs there is a risk of contagion from one market to another.

Clearing houses have a low failure rate in comparison to other financial companies like banks, financial intermediaries, and insurance companies. Only three occurrences of CCP failures are known, being Paris in 1974, Kuala Lumpur in 1983 and Hong Kong in 1987. The first two examples concerned the commodities market; the third concerned the futures market. The low failure rate in itself does however not provide enough comfort to supervisors. CCPs are subject to ongoing oversight by central banks, because of their systemic importance. The risk management of a CCP is one of the key aspects in evaluating the soundness of a clearing house.

A CCP faces various types of risk, such as counterparty credit risk, legal risk, operational risk, settlement bank risk and investment risk. Counterparty credit risk is the type of risk most closely related to the unique role of the CCP. It is the risk that one of its clearing members will not settle an obligation for full value, either when due or at a time thereafter. As the counterparty to both the buyer and the seller the CCP takes over the counterparty risk of both the buyer and the seller. In case one of them is unable to deliver the cash or the securities, the CCP guarantees the delivery of cash or securities despite the failure of one of the counterparties. The CCP does not *eliminate* counterparty risk, but manages it on behalf of its clearing members and redistributes it across its clearing members. Counterparty risk can be subdivided into principal risk and replacement cost risk.

Principal risk is the risk that a whole principal amount will be lost since the counterparty will not settle its obligations for full value at any time. This type of risk is however to a large extent eliminated by the delivery versus payment mechanisms used by the payment systems through which CCPs settle their transactions. Such delivery versus payment mechanisms ensure that delivery only occurs if payment occurs; a counterparty cannot be the legal owner of both the cash and the securities of the same transaction, at any time during the post trade life cycle of a transaction.

This article focuses on replacement cost risk, the other type of counterparty credit risk, since intraday margin is one of the tools to mitigate this type of risk.

Replacement cost risk

Replacement cost risk is the risk that the counterparty to a transaction will default before final settlement has occurred. The resulting exposure is the cost of replacing the original transaction at current market prices. If a clearing member defaults the CCP has the obligation to deliver the cash or the securities instead. Logically the CCP will, as the party in the middle receive one leg of the trade. For example, if the buyer defaults, the seller will nevertheless deliver the accompanying securities to the CCP. To pay the seller the CCP could sell the securities in the market and forward the proceeds to the seller. However, due to worsened market conditions the

CCP may face replacement cost. The new price may differ from the original price, due to unfavourable market developments, causing a loss to the CCP.

Therefore, the CCP has a crucial interest in mitigating the replacement cost risk. Although the risk management framework of CCPs might differ on details, generally the replacement cost risk is mitigated by requiring clearing members to deposit collateral to cover the exposure, called margin, and in addition by a clearing fund and other financial resources.

Replacement cost risk cannot be discussed fully without considering *liquidity risk*. The tools to mitigate replacement cost risk, like margin and clearing fund, are of little use if the collateral is deposited in illiquid assets. In the event of a default, a CCP has to use the margin of the defaulting member, the clearing fund and other financial resources to raise the necessary funds. However, because clearing houses typically seek to minimise the opportunity costs of members, the margin may be deposited in short term investments instead of in cash, for example in loans and commercial deposits. These non-cash assets must be liquidated or pledged before the clearing house can meet its obligatory transactions, which may be difficult or costly to complete in the time required. In case margin is deposited in cash CCPs may pay interest to the clearing members. On its turn the CCP may finance the interest by placing the margin in the money market. The risk that the CCP or the clearing members⁴ cannot liquidate their investments to obtain cash is the liquidity risk the CCP is exposed to⁵.

Therefore, assets used as margin or to fulfil the clearing fund requirements must themselves be liquid to enable the clearing house to quickly dispose of the assets, in order to settle obligations to other traders if necessary.

Tools to mitigate replacement cost risk

A CCP has several tools to mitigate replacement cost risk to which it is exposed. CCPs in Europe and the US typically have installed three lines of defence to protect themselves against the negatives consequences of a possible default of a clearing member, being margin, a clearing fund and other financial resources (see figure 1). First the three lines of defence are reviewed, before the intraday margining is discussed in detail, as an additional line of defence.

Figure 1

1 st line of defence	Clearing margin
Additional line of defence	Intraday margin
2 nd line of defence	Clearing funds
3 rd line of defence	Other financial resources

Clearing margin

The first line of defence is the deposit of collateral, called margin, of clearing members to the CCP to cover potential future credit exposures to clearing members. Margin is a term used in various contexts. In this article the term margin is used in the meaning of clearing margin, not to be confused with client margin or market maker margin, where the customer or the market maker deposits funds with their bank respectively with the exchange.

⁴ In case the clearing fund is an arrangement in which surviving clearing members provide funds to the CCP after a default has occurred

⁵ Liquidity risk can be used to describe the risk that a counterparty has insufficient liquidity to fulfil its obligations. It can also be used to describe the risk that an investment cannot be liquidated in time. To distinguish between both types of liquidity risk the latter type can be denoted as liquidation risk.

Bernanke (1990) describes margin as a principal way in which the clearing house protects itself against adverse selection and moral hazard on part of market participants. The posting of margin in advance makes a deliberate default unattractive when price changes are in the normal range.

Two common types of margin are initial margin and variation margin. Initial and variation margin are usually calculated at the end of each business day by the CCP, and then collected the next business day. Initial margin intends to cover potential future losses on open positions and is calculated by taking the worst probable one or two-day loss that the position could sustain. Initial margin can be paid in cash or collateral. Variation margin consists of funds to cover losses on open positions and is calculated by the CCP using recent market prices. Variation margin is required to cover securities and future positions, but is hardly used to cover option positions. The commonly used margining system for options requires the seller of the option to deposit initial margin to cover the sum of the current market value of the option plus a cushion for potential increases in the market value of the option. No variation margin is required in addition.

Some CCPs collect variation margin from clearing members on the loss making side of the market and redistribute it to the clearing members on the profit making side of the market. This process is called settlement to market. It is a zero sum game for the CCP and is typically used in future markets. In this case variation margin needs to be deposited in cash. A CCP may also collect the variation margin from the loss making side of the market and keep it as an extra protection cushion. This process is called marking to market. Variation margin then may be deposited in cash or in other assets. In some markets variation margin may also be used to describe the posting of collateral by a clearing member to cover a margin deficit in general, so also resulting from changes in positions of clearing members. This article will use the term variation margin to describe the funds that are paid by a clearing member to settle any losses resulting from price changes, independent whether a settlement to market or a marking to market process is used.

Margin can be calculated on a gross and on a net basis. Under gross margining members are required to deposit margin sufficient to cover their gross positions. Under net margining the long and short positions are netted against each other and the margin should be posted based on the net positions⁶. Most CCPs use a net margining system for economic reasons.

Margin provides the CCP with a substantial defence against the default of a clearing member, but the chance still exists that the losses caused by a defaulting member may exceed the deposited margin. The BIS (1997) describes three reasons why the deposited margin might prove to be insufficient:

1. An important reason is that the height of the required margin does not intend to cover losses from all possible price movements.
2. Also, a defaulting clearing member may have increased the size of its open positions since the last margin settlement.
3. In addition, the calculation of the required margin often assumes a one day loss, whereas in practice a CCP may be exposed two or more days.

Because in some circumstances margin might not provide enough protection, many CCPs have installed a clearing fund.

Clearing fund⁷

A clearing fund is the second line of defence in case of default of a clearing member. The CCP requires participants to post assets in a clearing fund that can be used in the event of a default by any participant. The Recommendations for CCPs (CPSS-IOSCO 2004) define a clearing fund as a fund composed of assets contributed by a CCP's participants that may be used by the CCP in certain circumstances to cover losses and liquidity pressures resulting from defaults by the

⁶ The terminology 'long and short positions' are for simplicity reasons also used for the cash market.

⁷ Also known as default fund.

CCP's participants. In case the margin deposited by the defaulting clearing member appears to be insufficient to cover the loss of the closing out of its positions, the CCP can use the contribution to the clearing fund of this defaulting clearing member. If the contribution appears to be insufficient, the CCP may use the contributions from the non-defaulting clearing members, and may even require these survivors to replenish the clearing fund, with a second contribution. As such the clearing fund has the effect of sharing uncollateralized losses among clearing members. The extent of this mutualisation of losses varies between CCPs. In general, the higher the margin, the lower the clearing fund contributions, and so the lower the degree of mutualisation.

The clearing fund may be prefunded, hence a fund to which clearing members have contributed ex ante, or may be an arrangement to recover losses ex post from market participants that have agreed liability. The liquidity risk may be lower in the first case, because the CCP is less dependent on clearing members to free funds.

Financial resources

The final line of defence comprises other financial resources, like the own funds of the CCP or the CCP's contingent claims on parent organisations or insurers. A CCP may also meet the need for extra capital through committed credit lines.

3. A Theoretical Evaluation of the Benefits and Cost of Intraday Margin

In this section we examine a special subcategory of margin, namely intraday margin. Direct reason for this examination is the increased use of a routine intraday margin call in the EU. The aim of this article is to provide an evaluation of the benefits and cost of intraday margining along with the side effects. This might be relevant to CCPs and their supervisors who have to assess whether the benefits of a CCP outweigh the cost. As RSSS 4 (CPSS-IOSCO 2001) states the benefits and costs of a CCP should be evaluated. The evaluation might also be of interest to other stakeholders of the CCP, like clearing members. First the different types of intraday margin are described and subsequently the benefits and cost of intraday margining are discussed.

3.1 Types of intraday margin

Usually the CCP calls for margin on an end of day basis. The calculation of the required amount of margin is based on the end of day security prices and end of day positions of the clearing member.

Next to the regular end of day margin call a CCP should be able to call for intraday margin, as described by RCCP 3 and 4 of CPSS-IOSCO (2004). Recommendation 3 states that a CCP should measure its exposures at least once a day and should have the operational ability to measure its exposures on an intraday basis. A CCP should not only measure its exposures, but also take action if necessary. Recommendation 4 therefore specifies how to limit credit exposures for those CCPs that use risk-based margin requirements. To mitigate intraday risks, a CCP should have the authority and operational capacity to make intraday margin calls, at a minimum when prespecified thresholds are breached. The CCP usually uses the same algorithms for the calculation of intraday margin and end of day margin.

The BIS (1997) describes three types of intraday margin, namely a routine intraday margin call, a non-routine call that automatically occurs if market prices change sufficiently and a selective margin call, that requires the deposit of additional collateral by one or more clearing members, whose variation losses or initial margin deficits have reached a certain threshold.

The first type of intraday margin, the routine intraday margin, is calculated and called at one or more pre-specified times during the day. The routine intraday margin call is usually based on market prices and positions that are updated since the end of the last day. However, some CCPs may use updated prices combined with 'old' positions of the end of the last day. It is also

possible that the intraday margin is *calculated* at prespecified times during the day, but only called if a certain threshold has been reached, for example a price change.

The second type of intraday margin is called a non-routine price driven intraday margin call, because the call is made if a market suddenly becomes highly volatile and sharp price changes increase the exposure of the CCP. The price driven call may be triggered for example if a certain price limit is reached. The call is based on prices which are updated since the end of the last day. The call may be based on updated positions or on positions of the end of the last day. The updated prices are not necessarily recent market prices. Sometimes the price intraday margin call may be based on the level of the price limit, without revaluation against the actual market prices.

The third type of intraday margin is called a non-routine size driven intraday margin call, because the call is made if the size of the position of a specific clearing member increases strongly, which subsequently increases the exposure of the CCP. The size of the position is subject to both changes in market prices and to changes in positions caused by new trades. The size driven margin call may be triggered, for example, if the margin deficits of a clearing member exceed some predetermined threshold, which can be firm-specific.

Table 1 specifies the three different types of intraday margin and the characteristics per type. The difference between the three types lies in the trigger, but also in the calculation of the margin and the target group. For example, the price driven intraday margin is usually aimed at *all clearing members* with positions in the security with a sharp price increase, whereas a size driven intraday margin call is aimed at *one or a few specific clearing members* with an excessive margin deficit during the day. In practice CCPs may use more than one type of intraday margin. They may have installed a routine intraday margin call, but still decide to use ad hoc a price or size driven intraday margin call during the hours between two routine margin calls.

Table 1. Types of Intraday margin

<i>Type</i>	<i>Trigger</i>	<i>Addressed to</i>	<i>Call based on...</i>
Routine intraday margin call	Hour of the day	All clearing members	Updated prices and positions
Price driven intraday margin call	Extreme price changes to the opinion of the CCP and/or when a threshold has been reached	All clearing members with positions in the volatile security	Updated prices; not always updated positions
Size driven intraday margin call	Strong changes in clearing member positions to the opinion of the CCP and/or when a threshold has been reached	One or some clearing members	Updated prices and positions

An intraday margin call might also be triggered by other events than a large change in prices or positions, for example a change in the value of collateral, new products, new members or any event or information which raises the CCP's concern about a counterparty's ability to meet its margin requirement. These specific instances of intraday margin calls are not discussed further in this article.

3.2 Benefits of intraday margin calling

The aim and the most important added value of an intraday margin call are clearly to reduce counterparty credit risk. In addition an intraday margin call may reduce the liquidity risk of a CCP. Table 2 summarizes the benefits as well as the cost and side effects of the (introduction of an) intraday margin call by a CCP. These are discussed in the following parts of this section.

Table 2. Benefits, cost and side effects of an intraday margin call

		<i>Applies to:</i>	<i>Type specific:</i>
<i>Benefits of intraday margin call</i>	- Reduction of counterparty credit risk of CCP - Early detection of defaulting clearing member NB. An important condition for risk reduction is the final character of the transfer of cash and collateral (BIS 1997).	CCP, capital market in general	Benefits of a routine intraday margin call are higher since it reduces the chance of a margin deficit regularly during the day.
<i>Cost of intraday margin call</i>	- CCP has to invest in a system that enables it to determine intraday prices (in case of price driven intraday margin), intraday positions (in case of size driven intraday margin) or both (in case of a routine margin call). - CCP has to adapt operating procedures.	CCP	Cost for routine intraday margin call and size driven margin call largest
	- Initial and ongoing back-office cost - Cost related to additional collateral (opportunity cost, borrowing cost) - Increased liquidity risk	Clearing members	Cost for routine intraday margin call largest
<i>Side effects of intraday margin call</i>	Effect on clearing fund: - Principle of ‘defaulter pays’ stronger; mutualisation less strong - Pro: chance of moral hazard decreases - Con: clearing members less interest in safety CCP - Clearing fund contributions might be reduced	CCP, clearing members	Only in case of routine intraday margining
	Effect on collection of margins - CCP should choose how to collect clearing margin - Clearing member should choose if and how to collect additional client margin (especially relevant in case of gross margining)	CCP, clearing members Clearing members, trading members	Mainly in case of routine intraday margining
	Effect on trading behaviour: Give up / take up trading adapted to timing of intraday margin call	Clearing members, trading members	Only in case of routine intraday margining

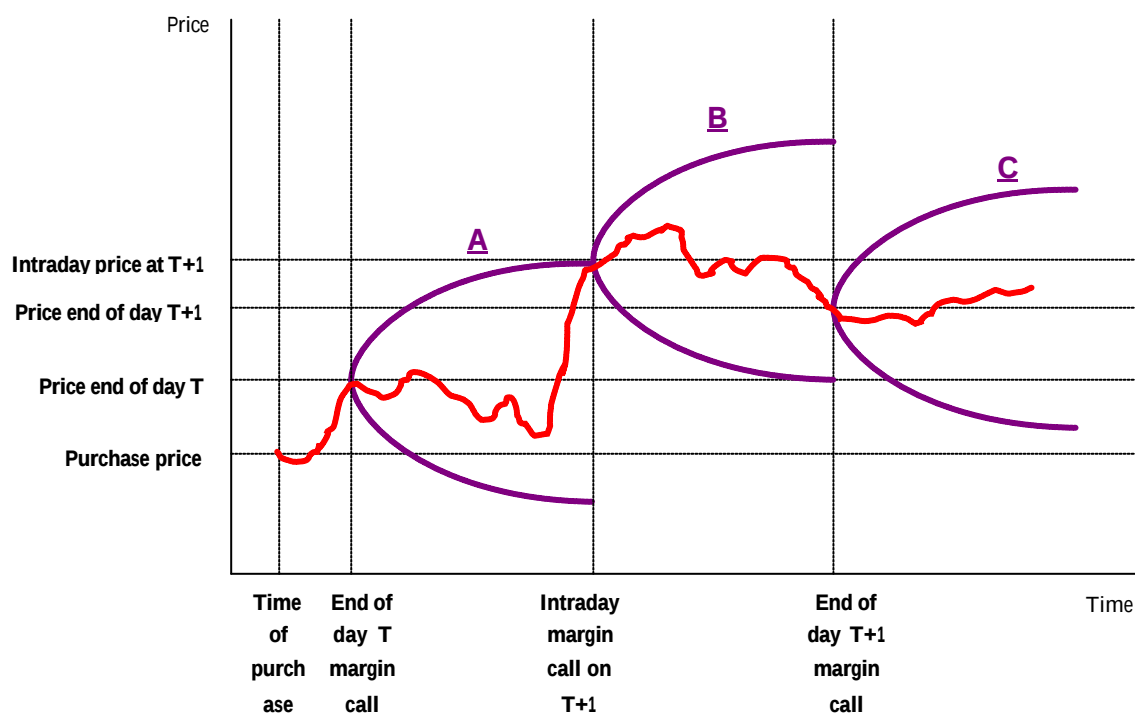
Counterparty credit risk reduction

A CCP faces the risk that the exposures of its clearing members can change as a result of changes in prices or positions, or both. Adverse price movements can rapidly increase the exposure of the CCP. In addition clearing members may increase their positions through new

trading, which also increases the exposure of the CCP⁸. Time is risk, so a CCP should recalculate its exposures to its clearing members frequently, based on timely information on market prices and on the size and concentration of positions. Based on updated price and position information a CCP may call for intraday margin to reduce its increased exposure. An additional benefit of intraday margin is that exposures resulting from day traders are captured during the day. Day traders mainly operate during the day and close a (large part of) their positions at the end of the day. An end of day margin call does not cover the counterparty credit risk towards these day traders during the day, whereas an intraday margin call offers the CCP the tool to take this risk into account.

The way an intraday margin call reduces counterparty credit risk in case of strong price movements is illustrated by Figure 2⁹ for a single futures contract. During trading day T the trading member, and indirectly the clearing member and the CCP, takes a position in a futures contract. At the end of T the CCP determines the amount of end-of-day margin that should be deposited by the clearing member. If the opportunity costs to traders of posting margin were zero, clearing houses could set margin requirements high enough to cover any conceivable market move; however, posting margin is costly. Hence, the CCP sets the initial margin in such a way that the probability of non-coverage (i.e. of a price change exceeding initial margin) is equal to a prespecified level of x%. Assuming that returns of futures are normally distributed the chance that price changes during the next day will be covered by the required initial margin is represented by curve A in Figure 2.

Figure 2. The Risk Mitigation Effect of an Intraday Margin Call



⁸ Some CCPs impose limits on the positions of clearing members to maximise the exposure caused by new positions.

⁹ This is an adaptation of a similar illustration in Eurex (2003)

As long as losses per contract resulting from price changes are smaller than posted margin, i.e. the price develops during T+1 within the borders of curve A, the performance of contracts is automatically assured. The CCP is exposed to replacement cost risk when the change in the futures price exceeds the required margin, so when the price moves outside of curve A.

In case of an intraday margin call the margin requirement will be recalculated either at a specific hour of the day or when the price or size of positions requires so. In case of a deficit the clearing member should provide the CCP with additional collateral. The necessary margin is again calculated in such a way that the probability of non coverage equals the same prespecified level. In a simplified situation, ignoring the time difference between the intraday margin call and the moment the payment of the required margin is settled, the chance that the price change will be covered by the margin is represented by curve B.

Figure 2 illustrates that an intraday margin call offers the CCP the opportunity to reduce the chance that the price change will result in a margin deficit. In the absence of an intraday margin call the chance that the price change would exceed the deposited margin may be substantially higher, since the deposited collateral is not adjusted to more recent price information.

A similar argumentation holds for increases in positions of clearing members. An intraday margin call enables the CCP to adjust the deposited margin to more recent position information, thereby decreasing the chance that a margin deficit will occur and the CCP subsequently is exposed to counterparty risk.

The first two drawbacks of margin as described in section 1 are thus partly elevated by intraday margin. The first drawback of margin is that the amount of required margin is not intended to cover losses from all possible price movements, but an intraday margin call increases the chance that price movements during the day are covered by the deposited collateral. The second drawback points out that a clearing member might have increased the size of open positions so the deposited margin becomes insufficient. An intraday margin call will enable the CCP to detect the increased size of positions earlier, namely during the day instead of at the end of the day.

A routine intraday margin call has some benefits compared to a price or size driven margin call. A routine intraday margin call reduces the chance of a margin deficit regularly during the day, whereas the price or size driven margin call is 'only' triggered when the price and/or position changes are well underway to cause a margin deficit.

The risk reduction character of intraday margin is widely recognised. For example, Fenn and Kupiec (1994) analyse the margin-setting behaviour of futures clearing houses in the US. They analyse the margin histories of three prominent US stock-index future contracts, being the NYSE Composite contract (clearinghouse ICC¹⁰), the S&P500 (clearinghouse CME¹¹) and the MMI (clearinghouse BOTCC¹²) contract. Fenn and Kupiec find that in the period before the initiation of intraday margin calls, there have been numerous instances when daily price changes exceeded required margin. However, once the clearinghouses had introduced the price driven intraday margin calls, these calls were made on most days when the close-to-close price return exceeded margin.

The BIS paper no. 23 (1997) states in general that intraday margin calls tend to reduce the credit exposures of a CCP. The extent of risk reduction depends on three conditions. First the settlement of the initial margin should involve a final transfer of funds to the clearing house. In case of provisional settlements unwinding could occur, making the credit reduction provisional and thereby illusory. Second, if eligible collateral, instead of cash, is provided to the CCP as the

¹⁰ International Clearing Corporation (check)

¹¹ Chicago Mercantile Exchange

¹² Board of Trade Clearing Corporation, now called CCorp of the Clearing Corporation

result of an intraday margin call, these transfers should also be final transfers. Third, the benefits of an intraday call are greatest if the call includes the larger share of trades that have been executed and matched since the last settlement.

Early detection of the default of a clearing member

In some cases the default of a clearing member may be detected by the CCP, when the clearing member appears to be unable to deposit the necessary funds. In these cases, an intraday margin call provides the CCP with the advantage to discover a possible default during the day instead of at the end of the day.

The sooner the CCP starts to close out on a defaulting member's positions, the smaller are the potential credit exposures on those positions, and so the smaller is the risk for the CCP. As an intraday margin call enables to detect a possible default earlier the CCP can start earlier to close out the clearing member's positions. So the CCP will be exposed for a relatively shorter period than with an end of day margin call only.

This elevates the third general shortcoming of margin as mentioned in section 1. This drawback states that margin might prove to be insufficient since margin calculation assumes a one day loss, whereas CCPs may be exposed for longer periods.

3.3 Cost of intraday margin calling

The cost connected to intraday margin calling can be split into cost for the CCP and for the clearing member.

Cost to CCP

A CCP faces initial cost, when the intraday margin call is introduced, especially in the case of a routine and size driven intraday margin call. The CCP has to invest in a system that enables it to determine intraday prices (in case of price driven intraday margin call), or both (in case of a routine and a size driven intraday margin call). In addition a CCP has to adapt its operating procedures. The ongoing cost for the CCP may consist of an intensification of operating procedures and additional human resources.

Cost to clearing members

Clearing members will also face additional cost when an intraday margin call is implemented. Maquire (2005) identifies both initial and ongoing cost. In preparation of the introduction of intraday margining, clearing members have to adapt their back-office systems to ensure that they have the mechanisms in place for same-day payments. In the situation of an end-of-day margin call clearing members have to deposit their collateral early the next day. This enables clearing members to run full reconciliation and batch processing in their back offices overnight. In case of a routine intraday margin call the funds and collateral have to be deposited on a standard basis within a much shorter timeframe. Hence, clearing members have to conduct a full reconciliation process within this timeframe. The adaptation of back office systems requires an initial investment. Two instead of one reconciliation process causes an overall increase of cost.

Another type of ongoing cost to clearing members concerns the collateral management. Without an intraday margin call clearing members try to place a surplus of liquidity into the money market. In case of an intraday margin call clearing members may choose one of several options. First they reserve some liquidity in case the CCP calls for additional collateral. Clearing members face opportunity cost related to the liquidity reserved. A second option is to borrow liquidity in case the CCP calls for additional collateral during the day. In this option clearing members face the cost of borrowing the collateral. A solution might be that clearing members deposit excess collateral to cover a potential collateral need as the result of an intraday margin call. The excess collateral could be cash, for which the CCP pays some interest, or other assets.

Clearing members may also face additional liquidity risk. High volatility may cause a clearing member to deposit extra collateral, which in some cases, may cause liquidity problems.

3.4 Side effects of intraday margin calling

The introduction of an intraday margin call may have consequences for the clearing fund, the client margining and may also affect the trading behaviour of market participants. The consequences are especially valid in case of a routine intraday margin call, because of its daily character. A price or size driven intraday margin call occur usually on an incidental basis, having less far-reaching consequences.

Effect on clearing fund

The use of an intraday margin call, and especially a routine intraday margin call, influences the risk management framework of a CCP. The introduction of an intraday margin call places in effect an additional layer in the risk management framework, or at least strengthens the first line of defence, see Figure 1. This extra layer of protection comes ahead of the clearing fund, so the clearing fund is one extra step away from being at risk.

As a consequence the extent of mutualisation within the risk management framework of the CCP decreases and the principle of ‘the defaulter pays’ becomes a stronger reality. A lower extent of mutualisation might lead to decreased exposure that clearing members face on each other through the clearing fund, but also to lower involvement in the general role of the CCP. The clearing fund contributes to the awareness of clearing members that a CCP is not a free good. Because of the clearing fund clearing members are directly exposed to losses that a CCP will face in its role as counterparty to a defaulting member. A decreased mutualisation might lower the interest of clearing members in the CCP’s ability to monitor and control its counterparty credit risk (BoE 1999).

On the other hand the stronger principle of ‘the defaulter pays’ may prevent moral hazard, i.e. the possibility that some firms exceed the levels of risk that they would be willing to bear privately, since they will be exposed to only a proportion of any losses.

Another consequence of the new position of the clearing fund in the risk management framework could be that the CCP changes the algorithm to calculate the size of the clearing fund in such a way that the clearing fund contribution per member decreases. After all, the need for the clearing fund is reduced.

Effect on collection of margin

A CCP can choose to pay out any intraday profits to clearing members, but it can also choose to net the intraday profits against any increases in end of day margin, thus reducing the size of the next margin call. The CCP can also choose for the model of CCorp or CME (Dale 1997). During the routine intraday margin call of CCorp both initial and variation margin is called, however only the variation margin has to be deposited during the afternoon. In case of an intraday profit CCorp pays 90% back to clearing members, but the remaining 10% is held back as a buffer to compensate for the lack of initial margin. The advantage for clearing members is that clearing members do not have to run a full reconciliation process intraday. The CME also has a routine intraday margin call during the afternoon. Of the variation margin collected during the afternoon from the loss making side of the market, only 90% is paid to the profit making side of the market. The remaining 10% is kept by the CCP as an additional protection.

The introduction of an intraday margin call raises the question whether clearing members should pass on the margin call to their customers (Maquire 2005). The clearing member may require its trading members to pay client margin¹³ during the day following an intraday margin call. The clearing member may also decide to pay the margins on their behalf and/or to increase the daily customer margins to try to cover the routine intraday margin call. The effect of an intraday margin call in this respect might differ for gross and net margining. It might well be that the net

¹³ Client margining is the margin paid by the trading member to its clearing member.

effect of an intraday margin call is small for the clearing member, reducing the need for an additional client margin call.

Effect on trading behaviour due to give-up trading

Intraday margin might influence give-up trading (Maquire 2005). Give-up is a procedure in securities or commodities trading where a trade is done by a trading member but cleared by another clearing member than the clearing member of the trading member. Therefore, the trade leg has to be given up by the clearing member of the trading member to another clearing member. A reason for give up trading is that an institutional investor uses several trading members, but wants his position administrated by one clearing member.

Trading members active in give-up trades have the chance to be called for intraday margin for trades they will transfer to the account of another clearing member a couple of minutes later. The exposure of the CCP towards the clearing member of this trading member will be redirected to another clearing member, whereas the first clearing member has to deposited collateral as a result of the intraday margin call. Trading members might adapt their trading behaviour by temporary abandon give up and take up trades during the period that the routine intraday margin is called.

4. Intraday margining policy of EU CCPs

This section complements the theoretical part of the paper with the current policies of CCPs in the EU, as outlined in Table 3⁴.

4.1 Increased implementation of a routine intraday margin call in the EU

During the last couple of years the routine intraday margin call is increasingly used in the EU. Before 2001 not one EU CCP used an intraday margin call. Currently, three out of the eleven CCPs have introduced a routine intraday margin call and other CCPs intend to do so. The three CCPs that do have a routine intraday margin call for one or more markets are LCH.Clearnet Ltd, KELER and CC&G. The CCPs that intend to introduce an intraday margin call are the CCP of Austria and LCH.Clearnet SA.

In 2001 the British CCP LCH.Clearnet Ltd has installed a routine intraday margin call for cash equity and is planning to also introduce a routine intraday margin call for futures and options. For cash equity a call is daily made at 1 p.m., based on updated prices and updated positions. Each clearing member is called, subject to *a de minimis* exception if the amount is less than £ 10,000. The call is not subject to a certain threshold that has to be reached. The collateral should be deposited within one hour and can be deposited in cash and non-cash assets. LCH.Clearnet Ltd had planned to introduce a routine call for futures and options in the second quarter of 2006, but has postponed the launch without specifying a new target date.

In 2002 the Hungarian CCP KELER has installed a routine intraday margin call for its cash market. The routine intraday call is made at 12 a.m. based on prices and positions of the night before. The end of day positions are modified by the positions settled at 11 a.m. on the day of the intraday margin call. Collateral should be deposited immediately in cash and non-cash assets as accepted by the CCP. KELER has a routine intraday call for its cash market, because of the lack of a non-routine intraday margining possibility. The CCP is working on the operational possibility to also introduce a price driven intraday margin call for its cash market.

In April 2003 the Italian CC&G installed a routine intraday margin call for all its markets, so for cash, derivatives, government bonds and repo's. The call is made at 12 a.m. based on updated

¹⁴ To enrich this article with a recent snapshot of the European practice of intraday margining, a fact finding table has been sent to European CCPs. The survey contained questions on the end of day margin call and the intraday margining policy. All CCPs have kindly cooperated to ensure up to date and correct information.

prices and positions and only called if a threshold has been reached. The clearing members should deposit the collateral within two hours, so at 2 p.m. The collateral should exist solely of cash.

Table 3. The Use of Intraday Margin by EU CCPs*

CCP	Country	Markets	Routine intraday margin call	Non-routine price driven margin call	Non-routine size driven margin call
CCP Austria	Austria	Cash	Intends to introduce	Yes	Yes
		Derivatives	Intends to introduce	Yes	Yes
LCH.Clearnet SA	Belgium, France, the Netherlands, Portugal	Cash	Intends to introduce in 2006 / 2007	Yes	No
		Derivatives	Intends to introduce in 2006	Yes	No
		Bonds, repos	No	Yes	No
OMX Exchanges	Denmark, Finland, Sweden,	Derivatives	No	Yes	Yes
EUREX Frankfurt	Germany, Ireland	Cash (FWB, Xetra, ISE), derivatives bonds, repos	No	Yes	Yes
ADECH	Greece	Derivatives	No	Yes	Yes
KELER	Hungary	Cash,	Yes, since 2002	Intends to introduce	No
		Derivatives	No	Yes	No
CC&G	Italy	Cash, derivatives, bonds and repo's	Yes, since April 2003	Yes	Yes
NOS ASA	Norway	Derivatives	No	Yes	Yes
KDPW	Poland	Derivatives	No	Yes	Yes
MEFF	Spain	Derivatives	No	Yes	Yes
LCH.Clearnet Ltd	United Kingdom	Cash equity,	Yes, since 2001	Yes	Yes
		Derivatives	Intends to introduce	Yes	No
		Cash bonds and repo	No	Yes	Yes
		Interest rate swaps	No	Yes	Yes

* Including Norway

Despite the increased use of a routine intraday margin call in the EU it is not likely that all CCPs will adapt this policy. Some CCPs have concluded that non-routine intraday margin calls, in combination with other risk management tools, are sufficient protection against credit counterparty risk. One example is the CCP of OMX, which is the CCP for the Danish, Finnish and Swedish derivatives markets. OMX measures intraday risk exposures throughout the day against individual risk limits for each clearing member. A breach of limits may result in a non-routine intraday margin call. However, usually when a limit is breached a clearing member will choose to limit or close out its positions, making an intraday margin call redundant.

EU versus US

Whereas CCPs in the EU only recently started to introduce a routine intraday margin call, US clearing houses use a routine margin call since 1987. Dale (1997) describes thoroughly the risk management practices of three prominent CCPs in the US, being the Chicago Mercantile Exchange (CME), The Clearing Corporation (CCorp, former BOTCC) and the Options Clearing Corporation (OCC).

The CME makes an end of day margin call, based on positions and prices at the end of the trading day. The collateral should be settled by 6.40 a.m. the next morning. In addition, a routine intraday margin call takes place at 2.00 p.m. based on positions of 11.30 a.m. and prices collected at 12.15-12.30 p.m.. The collateral has to be deposited one hour after the call, so at 3.00 p.m. The CME makes additional intraday mark to market calculations and has the authority to call for a price driven intraday margin call to ensure immediate payment of variation margin where, for instance, a clearing member has concentrated positions on the losing side of the market.

CCorp has an end of day margin call, like the CME, with settlement at 6.40 a.m. also. CCorp also has a routine intraday margin call at 2.00 p.m., with settlement of collateral at 3.00 p.m.. CCorp's routine intraday margin calculation covers trades matched up to 1.20 p.m., and uses market prices at 2.00 p.m.

4.2 Further examination of the intraday margining policy of CCPs in the EU

This paragraph examines the intraday margining policy of EU CCPs further, starting with the end of day margin call. All CCPs do have an end of day margin call, based on the end of day prices¹⁵ and end of day positions of clearing members. The collateral has to be deposited the next day, but the timing may differ. Most CCPs require their clearing members to deposit the collateral before the market opens in the morning, but some exceptions exist. For example, the Swedish OMX requires the collateral to be deposited at 11 a.m. with custodians; the custodians should confirm to the CCP that margin is in place by 12 a.m..

As Table 3 shows all CCPs do have the authority to call for intraday margin on a non-routine basis. For most derivative markets in Europe this authority exists since the start of the CCP. Also, all CCPs do have the authority for a price driven intraday margin call and many, but not all CCPs do have the authority and operational capability of a size driven intraday margin call. There's one exception to this general picture, which is the Hungarian CCP KELER. For the derivatives market KELER may call for a non-routine margin call, but its cash market has a routine intraday margin call.

Not all CCP's have chosen to adopt a non-routine size-driven intraday margin call. LCH.Clearnet SA for example relies solely on a price-driven intraday margin call. Their planned routine intraday margin might however enable them to also adopt a size-driven call. The policy of a CCP might differ per market. For example, LCH.Clearnet Ltd that serves several markets, does have both a price and size driven intraday margin call for the cash bonds and repo's, but has only a price driven intraday margin call for its future and option market. The CCPs with a price and size driven margin call usually base the calculation of the intraday margin call on updated prices and positions, independent whether the call is price or size driven. The CCPs with only price driven intraday margining, base their call on updated prices, but on positions of the night before.

The maximum time period in which the clearing member has to deposit the collateral ranges from half an hour (i.e. MEFF) to two hours (i.e. CC&G and CCP Austria). The type of required collateral also differs per CCP. Some, like EUREX Clearing, KPDW and CC&G, accept only cash to cover the intraday margin call requirements. Other CCPs accept the same collateral as for the usual end of day margin call.

Often CCPs, e.g. EUREX Clearing, offset the required intraday margin with the available initial margin of the day before. The clearing member has to provide collateral for the remaining exposure.

¹⁵ If, according to the CCP, the prices are no correct reflection of the real value of the security, the CCP usually has the power to review and modify the settlement prices in line with procedures, which are laid down for that purpose.

5 Conclusions

Intraday margining is an important feature of the risk management framework of a CCP and may be considered as best practice. It directly reduces the counterparty credit risk of a CCP which is favourable for the CCP as well as for the capital market as a whole. An intraday margin call enables the CCP to quickly respond to increased price volatility or growing positions of clearing members, in order to decrease the exposure of the CCP. An intraday margin call also enables the CCP to take the exposure towards day traders into account, and may contribute to an early detection of a defaulting clearing member.

It is generally accepted that CCPs should have the authority and operational capacity to call for a price and/or size driven intraday margin call. It can be concluded that all CCPs in the EU are able to call for margin on an intraday basis. All CCPs are able to do so during very volatile markets. However, not all CCPs are able to call based on updated prices and/or positions. Also, not all CCPs do have the possibility to call for intraday margin when clearing members rapidly build positions through new trading. Investments in operational systems may enhance the risk management system of such CCPs.

In the EU, an increasing number of CCPs is making use of a routine intraday margin call. The evaluation framework shows that intraday margining is not without cost. The benefits and cost should therefore be evaluated, especially when the CCP considers introducing a routine intraday margin call.

The frequency of margin calling and the decision whether to introduce a routine intraday margin call or not depend on the volatility of prices in the markets it serves. In addition the potential for clearing members to quickly build large positions in those markets should be taken into account, which depends on the liquidity of the markets and on whether the markets set and enforce trading limits or position limits. Also the willingness of clearing members to face initial and ongoing cost on their back offices and collateral management should be considered. After all, the benefits of a CCP should outweigh the cost.

References

- Bank of England (2002), *Modelling risk in central counterparty clearing houses: a review*, BoE Financial Stability Review, December 2002
- Bank of England (1999) *Central counterparty clearing houses and financial stability*, BoE Financial Stability Review, June 1999
- Bernanke, Ben S. (1990), *Clearing and settlement during the Crash*, The Review of financial Studies 1990, volume 3, number 1, pp. 133-151
- Bank for International Settlements (1997), *Clearing arrangements for exchange-traded derivatives*, CPSS Publications, No 23, March 1997
- CPSS-IOSCO (2001), *Recommendations for Securities Settlement Systems*, November 2001
- CPSS-IOSCO (2004), *Recommendations for Central Counterparties*, November 2004
- ECB (2001), *Consolidation in central counterparty clearing in the euro area*, ECB Monthly Bulletin, August 2001
- Eurex, *Clearing, Risk Based margining*, Eurex Communications, January 2003
- Dale, Richard (1998), *Risk management in US derivative clearing houses*, Essays in international financial & economic law, No 14, 1998
- Fenn, George W. & Kupiec, Paul (1993), *Prudential margin policy in a futures-style settlement system*, The Journal of Futures Markets, volume 13, no. 4, p 389-408, 1993
- London School of Economics (2005), *Securities trading, clearing, central counterparties and settlement in EU 25 – an overview of current arrangements*, Report by London Economics commissioned by the Competition Directorate General of the European Commission, June 2005
- Maquire, Frances (2005), *Trends and developments in intra-day margining and same-day settlement*, Derivatives Use, Trading & Regulation Volume eleven, number one 2005
- Ripatti, Kirsi (2004), *Central counterparty clearing: constructing a framework for evaluation of risks and benefits*, Bank of Finland discussion papers