SUPPLEMENTATION OF THE REGULATION OF ANTI-PROCYCLICAL MARGIN MEASURES

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KEYWORDS

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ABSTRACT

Our paper focuses on the procyclicality of margin requirements of central counterparties (CCP). The role of the central counterparties on the market is to take over the counterparty risk during the trading on stock exchanges. CCPs use a multilevel guarantee system to manage this risk, and the margin is one level of this system. The regulators have recognized, that the margin has procyclical effect on the market – in case of a stress event the margin has to be increased as a consequence of the increased volatility of the market –, so they have to take action in order to avoid this procyclicality as much as possible, not to punish the market in a stressed market situation. In this paper we will introduce those anti-procyclicality methods that were offered by the regulators in the so called EMIR (European Market Infrastructure Regulation) regulation, and point out that how the regulation should be extended in order to apply the anti-procyclicality methods properly and efficiently by the CCPs.

THEORETICAL BACKGROUND

Since 2008 the role and the systematic importance of the central counterparties gradually became essential on the financial markets. Bilateral relationships that prevailed between two counterparties are now by being settled through central counterparties, assuring the markets to be more secured. This guarantees the trade's fulfilment in case one of the traders default. In order to do so, CCPs must have a waterfall system of guarantees, in which margin has a notable weight.

Risk models are used by central counterparties to estimate the margin requirements of portfolios of financial instruments as one part of the guarantee system they have to use. Supervisors have recognized that in order to assure the smooth working of the financial markets, CCPs shall deal with procyclicality as an additional concern besides risk models. Generally speaking, procyclicality is defined as the tendency of any financial variable to move with the economic cycles. This is an undesirable property when the variable acts to intensify financial stress (Financial Stability Forum (2009)). The main negative result of highly procyclicality movement is the difficulty of funding tied with market liquidity risk (Brunnermeier and Pedersen (2009), Heller and Vause (2012)).

Authorities designated under Article 22 of EMIR that supervise CCPs authorized under Article 14 of the EMIR are applying the margining requirements to limit procyclicality pursuant to Article 41 of EMIR and Article 28 of the RTS (Regulatory Technical Standard). Currently the applicable articles for CCPs' referring to procyclicality seemed to be vague consequently its application lied on several presumptions.

Murphy et. al. (2016) follows the mitigation tools for procyclicality as per EMIR standards. Their findings indicate that all of the five tools – three models are based on the EMIR requirements, and two models are being built by themselves – are useful in mitigating procyclicality to some extent, but that the optimal calibration of each tool in a particular situation depends on the relative weights placed by the modeller. Glasserman and Wu (2017) examine the extent of margin buffer needed to offset procyclicality, their findings pointing to the important features of price time series that should inform 'anti-procyclicality' measures but are missing from current rules. Duffie et al. (2015) and Heller and Vause (2012) address the issue of margin requirements following the new regulations. Berlinger et al. (2017) suggests well-chosen margin strategies, concluding that in most cases, it lies inside the set of feasible strategies and represents a delicate compromise between different forces. Their main result is that the anti-cyclical margin is not only the interest of the regulator, but the CCPs as well, since it is decreasing the risks they have to face. They have pointed out, that there exists an optimal margin level,

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and this margin level is in most of the cases not a risk-sensitive margin.
In order to ensure common, uniform and consistent application of the EMIR provisions in the context of limiting procyclicality of margins without under- or overestimate procyclical margin, placing great burden on market participants, the high level subjectivity and presumptions shall be diminished from the legal content.

MARGIN CALCULATION METHODS

Our paper focuses on highlighting the discrepancies of the legal background on a theoretical and empirical level. Our main goal in this paper is to show how the regulation should be extended in order to reach their goal to build an anti-cyclical margin by the CCPs. In other words the margin requirement, the regulators would like to be achieved by the CCPs, is that the margin should be prudent, stable and reproducible by market participants. We will show that without specifying the method in more details, and applying the EMIR and the RTS regulation without any further assumptions, it can lead to a procyclical margin, or to an unreasonably high margin requirement.
We will analyse in the following three subchapters the three possible anti-cyclicality method for margin calculation, from which a CCP can freely choose, based on the regulation. The only thing we will focus on is the handling of anti-cyclicality, so we will not analyse the effect of any other margin parameter – e.g. the length of the lookback period, or other buffers than procyclicality.
The following assumptions will be unified for all of the three models:

- Risk measure will be the Value-at-Risk (VaR) model, which gives the answer to the following question: what is the possible maximum loss on a given interval, on a given significance level on a portfolio (Jorion, 2007). The model will be calculated was the historical method in two cases, and twice with the delta normal method. The historical method means, that the value of the VaR will be based on the historical prices of the financial asset, while in case of the delta normal method, the VaR will be calculated based on the assumptions, that the logreturn of the financial asset is normally distributed (in more details: Jorion, 2007).
- Significance level: 99%.
- Liquidation period: 2 days.
- Product, the model is calculated to: OTP stock, one of the most liquid central European stock.
- Lookback period: 250 days.
- Only risk factor in the model is the change of the price of OTP stock.
- Calculations are based on logreturns.
- The regulator's general requirement regarding procyclicality: EMIR Article 41.: '…A CCP shall regularly monitor and, if necessary, revise the level of its margins to reflect current market conditions taking into account any potentially procyclical effects of such revisions…' and RTS 28.1: 'A CCP shall ensure that its policy for selecting and revising the confidence interval, the liquidation period and the lookback period deliver forward looking, *stable and prudent* margin requirements that limit procyclicality to the extent that the soundness and financial security of the CCP is not negatively affected. This shall include *avoiding* when possible disruptive or *big step changes in margin requirements* and establishing *transparent and predictable procedures* for adjusting margin requirements in *response to changing market conditions*…' and finally RTS 28.2: 'When a CCP revises the parameters of the margin model in order to better reflect current market conditions, it shall take into account any potential procyclical effects of such revision.'

The three anti-procyclical methods the regulator offers are being analysed in the following chapters.

Application of a 25% procyclicality buffer

According to EMIR (648/2012) and the RTS's (153/2013) 28.1a) paragraph, the first option for handling procyclicality is to assign a 25% procyclicality buffer as an extra value added to the margin:

a) 'Applying a margin buffer at least equal to 25% of the calculated margins which it allows to be temporarily exhausted in periods, where calculated margin requirements are rising significantly (RTS, Article 28.1a, 2013)'.

This method requires the exhaustion of a 25% margin buffer in case the margin would increase notably. According to Murphy et al. (2016) if the volatility is increasing on the market, the risk is higher, so the margin is higher as well, so this should be the time to exhaust the buffer. In our viewpoint this is true, if we measure the margin on the level of the logreturn, but as a final result we measure the margin on the level of prices. Usually in case of a stress event, the volatility is increasing, but the prices are decreasing, so as a result the VaR will decrease, consequently the margins, too. Therefore, if we want to stabilize the margin – to not to be procyclical – it is not sufficient to exhaust the buffer in case of stress – because the volatility increases –, since it not necessarily means that the margin will increase as well. In Figure 1 and 2 we show this phenomenon. On Figure 1 the VaR can be seen, calculated for logreturns. It shows that between the price and the VaR the correlation is negative. Especially during stressed periods, namely the crisis of 2008, it can be seen, that the VaR has increased notably. But looking at Figure 2 when the prices were falling in 2008, the VaR was decreasing, too. A very notable positive correlation can be seen in the evolution of the price and VaR calculated for prices.

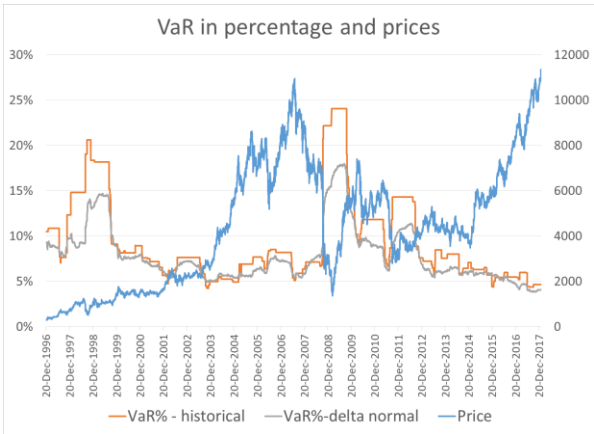

Figure 1: OTP stock's historical and delta normal VaR calculated for logreturns in percentage

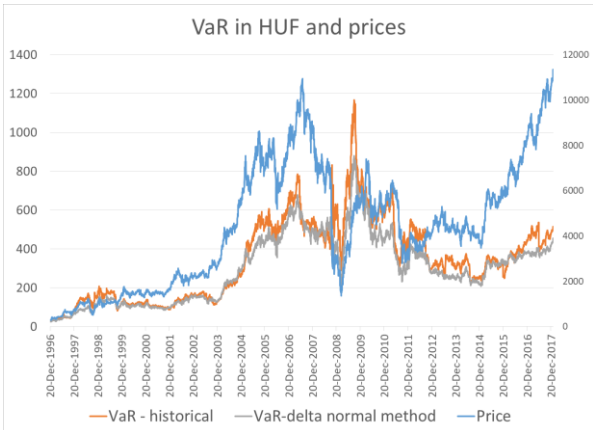

Figure 2: OTP stock's historical and delta normal VaR calculated for prices in HUF

Murphy et al. (2016) defines the time of buffer exhaustion, when there is stress on the market, since the volatility increases in that case. This is the common approach for defining the beginning of the exhaustion, but this is not the proper process, since the regulation does not say that in case of stress the buffer can be exhausted, but in case the margin would increase significantly. This can easily happen – if we measure the margin on HUF basis – when there is a boom on the market. This goes against the will of the regulators from our opinion.

For applying the 28.1 a) approach for margin calculation, we need to use some assumptions, since the regulation says nothing about the following:

- How much is the significant rise in margin requirement, when the buffer can be exhausted?
- How should the buffer be exhausted, and how it should be built back?

We will use the method of Béli and Váradi (2017), namely to exhaust the buffer gradually in the case the EWMA weighted standard deviation – EWMA standard deviation estimation is mainly used in margin models by participants in the OTC derivatives markets (Murphy et al. (2016)) – is higher, than the equally weighted standard deviation and start to build it back when it is the other way around. Moreover, the VaR is defined by a delta normal method, where the standard deviation parameter is either the equally weighted or the EWMA weighted standard deviation, whichever is the lower. We will not explain the method in more details, further we will just apply their method regarding the handling of the procyclicality buffer. Other parts of the model will not be applied. The results can be seen in Figure 3.

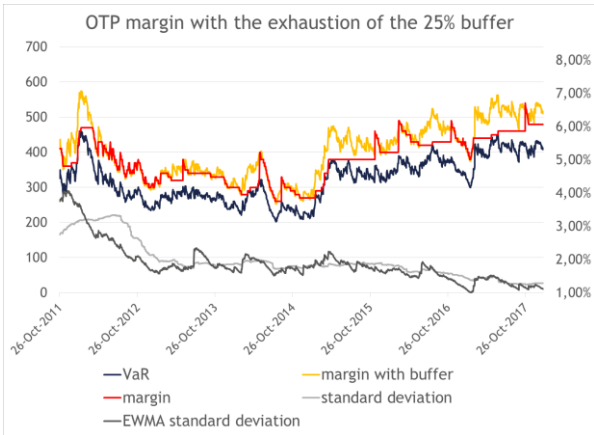

Figure 3: OTP stock's margin with the exhaustion of the 25% procyclicality buffer

According to Figure 3, the margin is being stabilized, based on the value of the changing volatility, and when the risk is increasing – quantified by the method of Béli and Váradi (2017) – on the market, the buffer is exhausted, and when the markets are getting calm, it is being built back. So it fulfils the requirement of the regulator. If we compare the margin to the price evolution of the stock, we can see that they are strongly moving together.

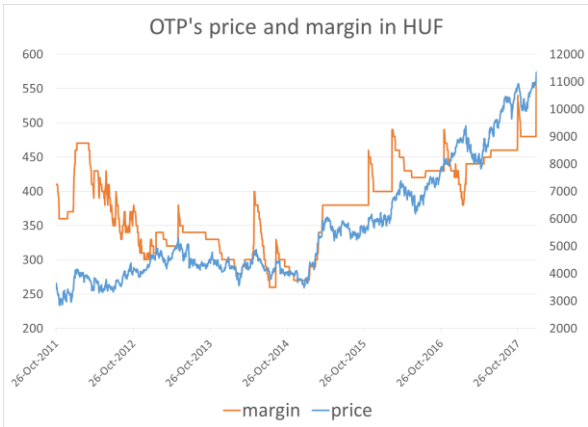

Figure 4: OTP stock's margin and price

Application of a stressed observation period

According to EMIR (648/2012) and RTS's (153/2013) 28.1b) paragraph the second option for handling

procyclicality is to assign 25% weight to stressed observations in the lookback period used to calculate margins.

b) 'Assigning at least 25 % weight to stressed observations in the lookback period calculated in accordance with Article 26 (RTS, Article 28.1b, 2013).'

However the mentioned article and regulation does not detail the definition of stress and does not provide any additional input on how to determine stress periods. ESMA issued a draft guideline[1] for providing an approach to implement the regulation in a harmonized way.

According to ESMA draft guidelines a CCP shall apply consistent approach for identifying a stress period and since every CCP is required to define stress scenarios to size its default fund(s) – which is also a notable part of the multilevel guarantee system, but introducing it goes beyond the topic of this paper – the CCP shall implement the observations defined in its stress testing methodology to its margining methodology.

According to ESMA if a CCP uses short lookback period (1 year is the regulatory minimum), the stressed observations may be limited and it can cause the instability of margin requirements. The inclusion of historical and hypothetical stress scenarios to the margining methodology would provide a consistent approach and the definition of stress would be in line with the CCP's own stress testing methodology. ESMA does not require calibrating the margins to stress levels, the CCPs shall assign 25% weight to its stress observations which are identified within its stress testing framework. ESMA guideline provides additional help to comply with the regulations but can it be implemented in a harmonized way? Does it really help the CCP's clearing members and clients to forecast their own margin requirement in periods of stress?

Implementation of the guideline is not obvious, there are still open questions. CCPs have several stress scenarios across various cleared products. For example there is a CCP that clears commodities (e.g. agricultural commodities like wheat, soy beans, etc) and also clears equity futures and options. While the CCP identifies stress periods for given product groups e.g.: the prices of the equity futures decrease because of a crisis, in the same time the CCP has to consider the correlation between prices and market movements, meaning that the prices of the agricultural commodities – in that given point of the crisis – are not decreasing, they show a slight increase, because the investors choose other investment forms to make their portfolios diversified. In this case the CCP calibrates a stress scenario based on the negative price changes on the equity futures market but this scenario does not describe stress period for agricultural commodities. The CCP has to calibrate another stress scenario for agricultural products based on the price history. This means that the CCP has several stress scenarios and the CCP has to choose the one which is the basis for calculating the margin requirement. The several numbers of stress scenarios for different cleared product groups does not help the clearing members and the clients understanding about the margining methodology of the CCP, however the method provides a consistent approach within the CCP's models.

In line with the guidelines the CCP has elaborated a model to calibrate the initial margin parameter considering the already applied stress scenarios. Because of the complexity of the CCP's stress testing framework there are several scenarios including the given product groups stress periods. For example in case of equity futures there could be at least two or three scenarios (e.g.'98 Russian crisis, '08 subprime crisis, and some hypothetical scenarios based on the reverse price changes of the historical scenarios) that contains stress period, which one shall be addressed as the one scenario to calibrate the margin model? The latest one or the one with bigger negative price shock? Or maybe the hypothetical one which assumes economic growth and positive price changes? For the sake of conservative approach (which is in line with ESMA's and other Supervisors' intentions) we chose the scenarios addressing the biggest negative and positive price changes.

In the following we are modelling the above mentioned approach to calculate the initial margin requirement for OTP considering the biggest negative price change based on the 2008 crisis. In the model historical VaR was applied. According to this method we have calculated the historical VaR value, which got a weight of 75%, while a stress parameter, based on the 2008 crisis (-22.09%) was considered with the weight of 25%. The results can be seen in Figure 4.

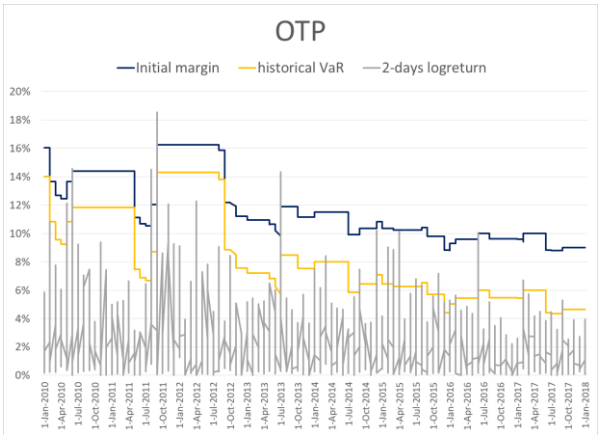

Figure 4: OTP stock's historical VaR and initial margin in percentage

We had 2011 observations in the model and the initial margin was not sufficient in 7 cases, the 2 days log-

[1] https://www.esma.europa.eu/press-news/esma-news/esma-consults-ccp-anti-procyclicality-margin-measures

returns were higher in an absolute value than the calculated initial margin, the model was proper in 99.65% of the cases. If the 2008 stress period had not been included in the model with 25% weight (only historical VaR calculation with 100% weight) then the appropriateness of the model would have been 98.11%. The inclusion of the stress scenario improved the goodness of the model, but analyzing the curves it can be seen that the sudden changes in the log returns result sudden changes in the value of the initial margin, meaning that the additional protection against procyclicality were not proved efficient to provide stable margin requirement. On the other hand the model reacts fast after a significant change in the log-returns but the level of the initial margin remains quite high for a long period of time which puts extra burden on the shoulders of the market participants. ESMA guidelines do not detail the possibility to exhaust the buffer in any case.

Moreover, if we calculate the initial margin in Hungarian Forint terms in Figure 5, we can see, that the anti-procyclicality requirement is not fulfilled, as the initial margin moves together with the price of the stock. The correlation that is calculated to the log-change of the two time series is strong, 0.9192.

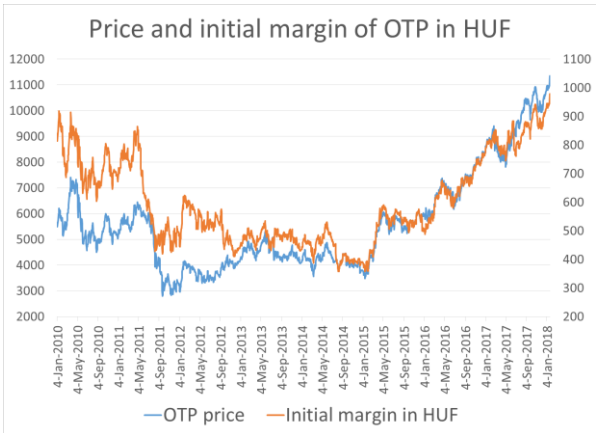

Figure 5: OTP stock's price and initial margin in HUF

Results show that this method is not efficient enough to handle procyclicality, and also in stabilizing the initial margin requirement. Our viewpoints in addition is that taking into account stress in the initial margin calculation is not necessary, since that is the goal of the default fund, which is calculated based on the result of the stress test. There is no need to take stress events twice into account in the multi-level guarantee system.

Application of a margin floor

According to EMIR (648/2012) and RTS's (153/2013) 28.1c) paragraph the third option for handling procyclicality is to define a margin floor, which gives the minimum value of the initial margin:

c) 'Ensuring that its margin requirements are not lower than those that would be calculated using volatility estimated over a 10 year historical lookback period (RTS, Article 28.1c, 2013).'

Based on this requirement we have calculated the initial margin once with the historical method, and once with the delta normal method. We have carried out the calculation exactly as it is written in the regulation, namely that we have calculated with the volatility of the last 10 years, and it gave the minimum value for the margin. The results can be seen in Figure 6 for the historical method and Figure 7 for the delta normal method.

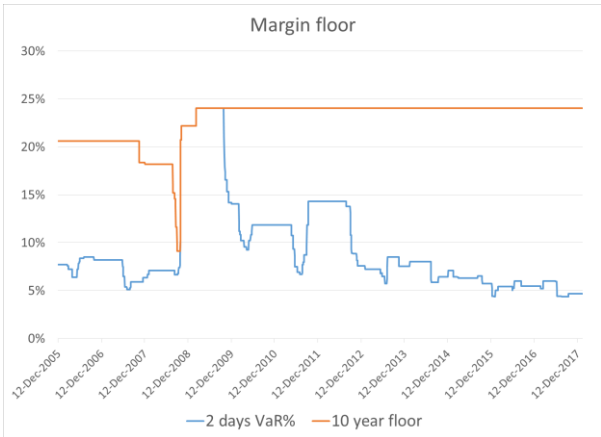

Figure 6: Margin floor based on the previous 10 years with historical method

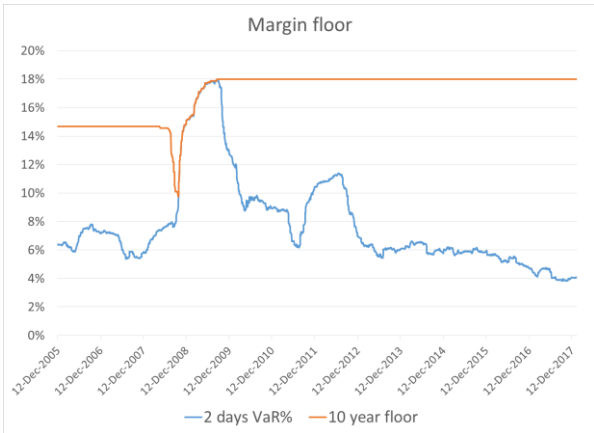

Figure 7: Margin floor based on the previous 10 years with delta normal method

As it can be seen in the figures the margin is high, and too stable, it doesn't follow the market trends. Although it avoids procyclicality, but results an unreasonably high margin requirement.

Calculating the margin in HUF terms can be seen in Figure 8 with both of the methods.

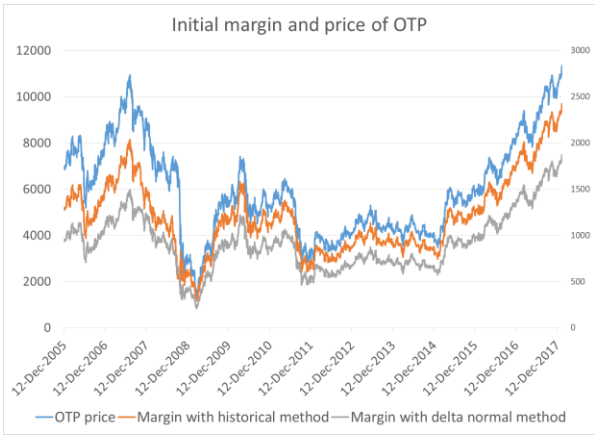

Figure 8: OTP stock's price and initial margin in HUF

We can see the same patterns as in the case of 28.1b) method, so in HUF terms the initial margin is following the market cycles, although in percentage terms it was 'too' stable. Based on Murphy et al. (2016) we run the calculations again, not to have this high margin floor. The approach is to take a certain percentile of the last 10 years' data. We have chosen the 20% according to Murphy et al (2016). The results changed notably as it can be seen in Figure 9, 10 and 11. In Figure 9 and 10 the minimum value of the margin is given by the 10 year floor, and in case when VaR with the 250 days lookback period is higher, then the higher value would be the initial margin. It can be concluded, that we have to take a certain percentile of the last 10 years data, otherwise always the floor would be the effective margin value.

Figure 9: Margin floor based on the previous 10 years with historical method at 20% percentile level

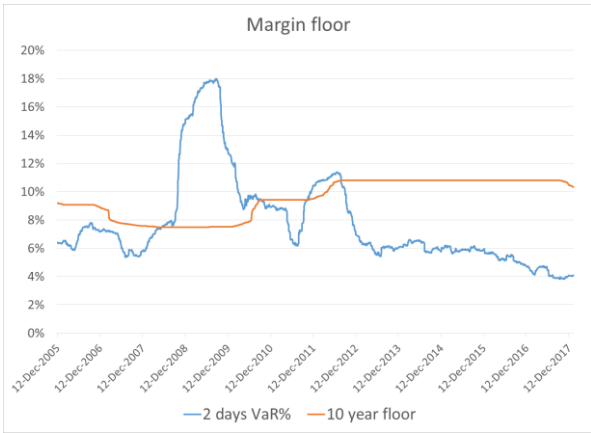

Figure 10: Margin floor based on the previous 10 years with delta normal method at 20% percentile level

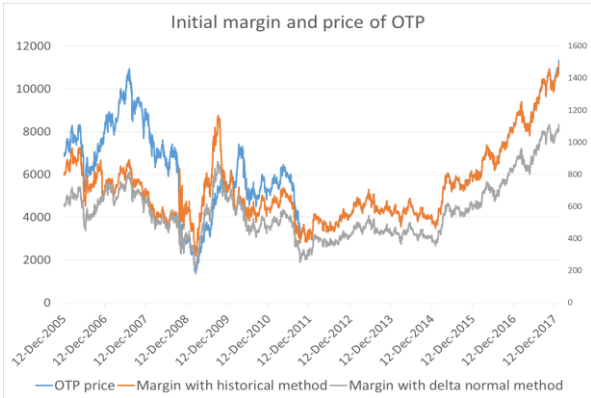

Figure 11: OTP stock's price and initial margin in HUF at 20% percentile

SUGGESTIONS FOR SUPPLEMENTATION

Based on the three models introduced in the previous subchapters, we have the following suggestions for supplementing, or for clarifying the regulations:

28.1a):

- Method of exhausting the margin buffer should be defined: in one step, gradually, etc.
- The main point in exhausting the buffer should be to stabilize the margin, not to decrease it. It is important especially in case of a stress event, for two reasons: 1) it threatens the financial stability of a CCP, 2) in case of stress if a CCP decreases margin, it would cause an increase in the value of the default fund, especially in case of stress. This is not necessarily in the interest of the market participants, since margin can be used by the CCP in case of the market participant's own default, while the default fund contribution can be 'taken away' by the CCP in case of the other clearing members' default.
- Building back the buffer should be explained.
- The regulation should state that the buffer can be exhausted when the risk is increasing – when the

volatility is increasing – not when the margin would increase notable.

- Stabilization should be carried out on margin level, not on the risk measure's – in our case on VaR – level.
- Not the margin increase should be in the focus of the handling of procyclicality buffer, but the stability, the change in the margin value. So not only the notable increase should be prevented, but the decrease as well.

28.1 b):

- Stress definition is also missing.
- Margin should cover losses for market risk in normal market conditions. Losses in case of stress events should be covered by the default funds.

28.1c):

- Definition of market floor should be in the regulation.
- A certain percentile should be applied. The regulator should consider a percentile to be applied uniformly on the markets.
- Further tools shall be introduced to avoid over and under margining due to the less flexible nature of the method.

REFERENCES

Berlinger, E., Dömötör, B. and Illés, F. (2017): *Anti-cyclical versus Risk-sensitive Margin Strategies in Central Clearing,* Working Paper. Corvinus University of Budapest Faculty of Economics, Budapest.

Béli, M. and Váradi, K. (2016): Alapletét meghatározásának lehetséges módszertana [A possible methodology for determining initial margin] *Financial and Economic Review*, Volume 16. issue 2, pp. 119-147.

Brunnermeier, M., Pedersen, L. (2009): Market liquidity and funding liquidity, *Review of Financial Studies*, Volume 22 No. 6

Duffie, D., Scheicher, M., Vuillemey, G. (2015): Central Clearing and Collateral Demand. *Journal of Financial Economics*, Volume 116, No. 2, pp. 237-256.

EMIR – European Market Infrastructure Regulation: Regulation (EU) No 648/2012 of the European Parliament and of the council of 4th July 2012 on the OTC derivatives, central counterparties and trade repositories (EMIR - European Market Infrastructure Regulation) Available: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012R0648&from=EN downloaded: 8th April 2016.

ESMA – European Securities and Markets Authority, Consultation Paper on Anti-Procyclicality Margin Measures. Available: https://www.esma.europa.eu/press-news/esma-news/esma-consults-ccp-anti-procyclicality-margin-measures downloaded: 9th January 2018

Financial Stability Forum (2009): *Report of the financial stability forum on addressing procyclicality in the financial system*, April.

Glasserman, P. and Wu, Q., 2017. Persistence and Procyclicality in Margin Requirements. *Columbia Business School Research Paper No. 17-34*

Heller, D. and Vause, N. (2012): *Collateral requirements for mandatory central clearing of over-the-counter derivatives*, BIS Working Paper No. 373

Jorion, P. (2007): *Value at risk: the new benchmark for managing financial risk.* Vol. 3. New York: McGraw-Hill

Murphy, D., Vasios, M. and Vause, N., (2016): *A comparative analysis of tools to limit the procyclicality of initial margin requirements.* Bank of England Working Paper No. 597.

RTS – Technical Standard: Commission delegated regulation (EU) 153/2013 of 19th December 2012 supplementing Regulation (EU) No 648/2012 of the European Parliament and of the Council with regard to regulatory technical standards on requirements for central counterparties. Available: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:052:0041:0074:EN:PDF downloaded: 8th April 2016.

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