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Systemic risk in the energy sector—Is there need for financial regulation?

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HIGHLIGHTS

- We assess the need for regulating OTC energy commodity derivatives under EMIR.
- We present a methodology to model systemic risk in non-financial sectors.
- We analyse direct and indirect channels for contagion giving rise to systemic risk.
- Contagion risk from the energy towards the banking sector is not relatively high.
- New EU regulation for energy OTC trading not supported by analysis of systemic risk.

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ABSTRACT

The credit crisis points at serious systemic risks in Over The Counter derivative trading. This has resulted in new financial regulation, covering both the financial sector and non-financial sectors. The actual extent to which non-financial companies trading on OTC markets contribute to systemic risk has hardly been the subject of research. This paper investigates the need for financial regulation in the energy sector, which shows a high use of OTC derivatives, by modeling systemic risk measured by the expected fraction of additional failing firms (EAF). Contagion risk within the energy sector and from the energy sector towards the banking sector is compared with that in other non-financial sectors. This paper adds to existing systemic risk literature by specifically looking at financial interdependence between a non-financial sector showing a high usage of OTC commodity derivatives and the banking sector, while contributing to the discussion on energy sector regulation with technical systemic risk analysis. Results indicate that contagion risk from the energy towards the banking sector is not relatively high compared to other non-financial sectors. Our results provide a first indication to question the need for generalized regulation of OTC derivative transactions, as recently introduced by the European Market Infrastructure Regulation (EMIR).

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1. Introduction

Systemic risk is widely considered a proper economic rationale for government regulation. What makes risk 'systemic' is its capacity to affect other companies or economic sectors not directly involved in producing the risky assets or the risky type of behavior in the first place. In this sense, it can be seen as an externality, a type of market failure that needs to be addressed by regulators and governments.

The impact of the global 2008 financial crisis made the reduction of systemic risk a top priority for policy makers. On the G-20 Summit of 2009 in Pittsburgh world leaders agreed to "fix the broken regulatory system", pointing to the need for "sweeping reforms to reduce the risk that financial excesses will again destabilize the global economy" (G-20, 2009). Such measures are currently implemented in the European Union through a diverse package of directives and regulations aiming to improve transparency and stability of financial markets, such as a revision of Markets in financial instruments directive-II (Mifid) and the new European market infrastructure regulation (EMIR). The latter regulation, which came into force on 16 August 2012, focuses on Over The Counter (OTC) derivatives trading. It requires standard derivative contracts to be cleared through Central Counterparties (CCPs) and regulates margins for uncleared trades and establishes

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stringent organizational, business conduct and prudential requirements for these CCPs.[1] With EMIR the scope of financial regulation is expanded towards non-financial sectors, assuming systemic risk can be channeled from non-financial sectors to the financial sector through the use of derivatives. Although the credit crisis indeed points at serious risks in OTC derivatives trading, the actual extent to which non-financial companies contribute to systemic risk has hardly been the subject of research. Policy discussions on EMIR have generally focused on regulation design and the necessity of practical rules.

OTC derivative trading is an essential element of activities and risk management in the energy sector. Derivative trading plays a natural role in power and natural gas markets due to the need to hedge price risks. OTC contracts are generally not centrally cleared but subjected to risk management aiming to find the optimal solution to the triad challenge of market risk, credit risk and liquidity risk. For instance, the Dutch (virtual) market place for trade in natural gas *TTF* shows an estimated market size of 7571 TWh in 2012, of which 83% was OTC traded through brokers and 11% was bilateral trade without brokers. The majority of wholesale electricity volumes is also traded on the OTC market: 60% in 2012, versus 22% bilateral trade without brokers and 18% via exchanges (Autoriteit Consument & Markt (ACM), 2013). Financial regulation of OTC derivative trading will therefore potentially have substantial impact on the energy sector. On the other hand, OTC energy derivative trade is only a relatively small part of the total global OTC derivatives market. In terms of notional value, interest rates derivatives are by far the largest (82%) followed by foreign exchange (10%). All commodity derivatives combined, of which energy derivatives are only a part, have a notional value of around 0.5% of global OTC (BIS, 2014).[2]

This paper investigates the necessity for financial regulation in the energy sector. It uses a proxy for systemic risk based on the chance of companies defaulting given that at least one other company defaults, i.e. the expected fraction of additional failing firms EAF, to compare the degree of systemic risk in financial and non-financial sectors. Moreover, it introduces an indicator for the causality of contagion risk because the direction of the contagion is an essential element underlying regulation.

First this paper investigates how systemic risk *within* the energy sector compares to systemic risk *within* the financial sector. Second, the degree of contagion risk *from* the energy sector *towards* the financial sector is analyzed, which seems the primary reason underlying the choice to include energy sector derivative trading in the scope of EMIR. By measuring contagion risk from the energy sector towards the banking sector, and comparing this with contagion risk from other sectors towards the banking sector, this paper supports the policy discussion on non-financial sector regulation with analytical and quantitative arguments and refocuses the policy debate about EMIR on the question *whether* regulation is necessary in the first place rather than on the question *how* to regulate.

This paper is organized as follows. The introduction includes another two subsections. One discussing systemic risk and its relevance for OTC derivatives markets, and a second briefly exploring the current regulatory process aimed at reducing the risks of OTC trading by the energy sector. Section 2 first introduces the analytical framework, after which the data and the model used to analyze direct and indirect systemic risk are described. Section 3 presents the results of the empirical analysis, and Section 4 presents some points for further discussion. The final section concludes and discusses policy implications.

1.1. Systemic risk and OTC derivative markets

Systemic risk is a crucial part of the debate on financial regulation, but research on the economic fundamentals underlying this type of risk and even the search for a generally accepted definition is still in an early stage. In their paper on econometric measures of systemic risk, Billio et al. (2012, p.536) conclude that "[a]lthough most regulators and policymakers believe that systemic events can be identified after the fact, a precise definition of systemic risk seems remarkably elusive…". This is something policymakers struggle with, as they face the widely recognized need to act against systemic risk in financial markets.

The last couple of years a growing body of literature emerged focusing on the definition and measurement of systemic risk.[3] Anabtawi and Schwarcz (2011) define systemic risk as "the risk that a localized adverse shock, such as the collapse of a firm or market, will have repercussions that negatively impact the broader economy" which can be regarded a broad definition. In this definition, systemic risk is not limited to one specific sector or type of firm, and is only applicable if there are repercussions for the wider economy. An example of a more narrow definition is that of Adrian and Brunnermeier (2011), defining systemic risk as "the risk that the stability of the financial system as a whole is threatened". Their focus is on the financial system alone and risks to the stability of that sector are sufficient to speak of systemic risk. Implicitly, it is assumed that instability of the financial system will indeed have repercussions for the real economy.

The function of banks as financial intermediaries – thereby being a conditio *sine qua non* for funding of consumption and investments of many economic participants – implies a close relation with the real economy. In other words: a disruption of this function has direct impact on activities in the real economy.[4] This puts financial institutions at the center of the systemic risk discussion. A key question faced by the academic world and regulatory institutions alike is which financial institutions contribute (strongly) to systemic risk and how this can be assessed, preferably ex ante. If regulation design could differentiate between financial institutions that contribute strongly to systemic risk and those that do not, unnecessary regulatory burden for the latter category could be prevented. At the same time, this would provide incentives against taking decisions that increase systemic risk.

Early work by the International Monetary Fund (IMF), Financial Stability Board (FSB) and Bank for International Settlements (BIS) points to several elements in identifying systemically important markets: mainly size, substitutability, and interconnectedness (FSB, IMF and BIS, 2009). Substitutability refers to whether other components of the financial system provide the same services in case of failure, interconnectedness refers to the links with other parts of the financial system. Jouyet (2010) concludes "[Over The Counter] derivative markets obviously meet many of these criteria, naturally because of their size and interconnectedness that they create between participants, but also because the crisis exposed the interdependencies between these markets and other components of the financial system". OTC contracts are between two

[1] Regulation (EU) No. 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC Derivatives, central counterparties and trade repositories, Official Journal of the European Union, 27 July 2012, L201/1-59. Hereafter, *Regulation*.

[2] The notional value of total global trade in OTC contracts was $ 710 trillion end-2013 (Bank for International Settlements (BIS), 2014, p. 1).

[3] See for instance Schwarcz (2008) and Eijffinger (2010) for an overview and analysis of definitions and Anabtawi and Schwarcz (2011) for an elaborate analytical framework. Bisias et al. (2012) provide a survey of quantitative measures of systemic risk in the economics and finance literature.

[4] Reinhart and Rogoff (2009) argue that bank crises always impact real output on a macroeconomic scale. For empirical evidence, see for instance Rajan et al. (2008).

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