Introduction

Soaring gas prices have turned the steady migration by Americans to smaller cars into a stampede. [..] 'The era of the truck-based large S.U.V.'s is over,' said Michael Jackson, chief executive of AutoNation, the nation's largest auto retailer. [..] there are some indications that the trend toward smaller vehicles will reduce the nation's fuel use. (Vlasic, 2 May 2008, New York Times)

Americans are buying more new cars than ever before. [..] As gas prices fell, Americans upsized. This fall, small SUVs became the largest segment of the market, at 14 percent, beating out small and midsize cars. (The Associated Press, 5 January 2016)

To date, the twenty-first century has been marked by large fluctuations in global commodity prices. Among different commodities, crude oil plays a dominating role and represents, to a certain extent, an indicator of the overall development. It is not presumptuous to consider the oil price hike in 2008 and its preceding and subsequent strong variations as one of the outstanding global economic phenomena aside from the financial crisis, itself likewise erupting in 2008. At the moment of completion of this book, crude oil is still the most important energy source in the world. It has a benchmark function with respect to other fuels, notably natural gas and coal. On the one hand, oil contributes to prosperity and powers industrial production in the truest sense of the word. On the other hand, carbon emissions drive climate warming and hence are a long-run threat to the world's and people's well-being. Thus, the two citations above represent only a small sketch of the far-reaching impacts of oil market developments.

Against this background, the driving forces of the crude oil market become an issue of great interest. It is undoubted that crude oil shares many features with a conventional goods market with conventional feedback mechanisms between supply, demand and price. Yet, it would be too shortsighted to stop the analysis there. Our specific interest here is in the impact that monetary policy, that is, US monetary policy in our case, has on the crude oil market. The investigation of monetary policy effects requires a clear conception of the role of money in the economy. If it is neutral, as neoclassical economists argue it to be, at least in the middle to long run, changes in monetary conditions do not produce lasting effects.
However, if money is not neutral but, instead, allowed to have lasting impacts on both the supply and demand sides of the economy, an investigation of the connection between monetary policy and the crude oil market is not trivial anymore.

Crude oil has a dual character: it is both a physical commodity and a financial asset. Its first nature makes it resemble a conventional goods market. The second one is due to trading of futures contracts in commodity exchanges. As a consequence, monetary policy has the potential to affect the oil market through both aspects, that is, once through fundamentals in the spot market and once through ‘paper oil’ in the form of a financial asset. Hence, the same thing is traded in two different markets, which are nevertheless closely connected. Moreover, complex interdependencies between both mechanisms of transmission may arise. The spot and the futures markets compose the crude oil market as a whole.

In connection to the issue of money, the understanding of economic processes as such is crucial. In neoclassical theory, economic activity is embedded in a general equilibrium framework where the result is determined by utility and profit maximization. It is founded by microeconomics by means of aggregating individual behaviour linearly to the macro level. However, one may doubt the usefulness of the aggregation procedure by simply summing up all individual magnitudes. The total of individual actions, including complex interactions, may give rise to unexpected and sometimes paradox outcomes at the macroeconomic level. The aggregation problem is subject to uncertainty (Keynes, 1936/1997, pp. 161–162). Uncertainty is the idea that makes economic activity a radically indeterminate issue. In such an environment of uncertainty where money is allowed to exert lasting effects, the crude oil market may be influenced by monetary policy through various ways. Specifically, speculation is allowed to become a crucial feature and a kind of connection between monetary policy and the oil market by impacting on the oil price.

To outline briefly, we argue that expansive monetary policy leads to speculation in the futures market. The resulting higher oil price triggers overinvestment in the crude oil spot market, pulling down the price eventually to a lower level than the initial one. There are two main problems arising. First, the dual nature of crude oil raises economic and financial instability in the crude oil spot and futures markets as well as, to some extent, in the rest of the economy. Second, overinvestment raises oil supply. The lower oil price has a positive influence on consumption, which amounts to a threat of ecological sustainability in general and climate in particular. It is these challenges that an economic policy design must address. More concretely, stable financial and economic conditions in the crude oil market must be achieved, conditions that take the ecological dimension into account and
provide a path towards sustainability. We will see that we can make use of the preceding insights into the workings of money, monetary policy, the crude oil market and the relationships in between. In this regard, our policy proposition is unconventional. Instead of aiming at eliminating any harmful effects of financial markets (the crude oil futures market in our case) on the real economy, we suggest how financial market mechanisms may be used to achieve a better economic outcome.

The analysis is divided in three parts. Part I contains the detailed theoretical analysis of our issue and emphasizes the crude oil market as well as a background from monetary theory to the extent that is required for our analysis. Chapter 1 starts with embedding the issue of crude oil in the currently existing environment and literature. Besides some stylized facts presented here, there are three principal domains concerning the crude oil market on which academic literature is focused. One is the debate about crude oil as an exhaustible resource and a fossil fuel. Another, an issue of great interest in economic research, is the existence and effectiveness of speculation in the oil market. Opinions are still widely diverging in this regard, while the view that, to a certain extent, speculation has tended to have a significant impact on the oil price, has gained ground in recent years. As a third topic, the role of the Organization of Petroleum Exporting Countries (OPEC) is debated.

Chapter 2 begins by emphasizing the nature and role of money in order to derive the functioning of monetary policy from it. Monetary theory can be broadly separated in a perspective that considers money as exogenous, that is, as a kind of commodity used for the exchange with goods and the quantity of which is controlled by the central bank. In contrast to this mainstream view inherent to neoclassical economics, the theory of endogenous money analyzes money as being created ex nihilo in the process of credit granting. Since money is demand-determined, the monetary authority cannot control its volume. This difference gives rise to a different understanding of monetary policy and its impacts. In the same way, the understanding of financial markets differs depending on the conception of money. Neoclassical economists rule out bubbles and endogenous distortions in financial markets by assuming the efficient market hypothesis. The existence of money does not affect the relationship between economic fundamentals and financial markets. By contrast, endogenous money, coupled with uncertainty, allows for a financial market evolution that is independent from the real economy to some extent. Speculation may become effective.

With the necessary insights into monetary theory, the oil market then is analyzed in light of the dual nature of crude oil. Monetary policy enters the stage by affecting the crude oil market both through fundamentals
and the futures market. The analysis is extended by investigating the transmission channels of monetary policy in detail with regard to both fundamentals and financial market aspects. Out of these effects, numerous mutual impacts between the spot and the futures market emerge. Yet, we can conclude unambiguously by theoretical analysis that monetary policy has an effect on the oil price as well as oil quantities, to wit, production and consumption.

Part II is engaged in putting the theoretical analysis into the context of the actually existing policy and market structures and examining the issue empirically. In Chapter 3, the practice of US monetary policy is presented first. The period covered in our empirical investigation, that is, in general, from 2000 until 2014, is marked by a radical change of how monetary policy is conducted. Conventional policy, by manipulating the federal funds rate, was the rule prior to 2008. In the course of the crisis, the target rate reached the zero lower bound so that ‘unconventional’ policy, mainly in the form of asset purchases, was adopted.

The chapter investigates then the global crude oil pricing system. Contrary to the widely held belief that a market price is a definite numerical value resulting from exchange, there is in fact no single price because every deal between two parties yields its own price. This reveals that despite many other imperfections in the real world, even the assumption of a single price is a simplification of reality. There are numerous influences that impede the realization of market efficiency. Nonetheless, crude oil market data show that the market is integrated with regard to the geographical and the temporal dimension: Prices of different types of crude oil around the world are almost perfectly correlated and so are spot and futures prices of different maturities. It is thus fair to talk about a globally integrated crude oil market. Integration goes even further to some degree as natural gas and coal seem to follow a remarkably similar price pattern, like crude oil, in the middle to long run.

The impact of monetary policy on the crude oil market is analyzed econometrically in Chapter 4. To summarize, clarify and represent the results of the theoretical analysis as well as for the purpose of the isolated effects that are going to be estimated, we construct a stock-flow consistent (SFC) model of monetary policy and the crude oil market. This model reveals the main effects and supports intuition for the remainder of this examination. All in all, empirical estimates suffer simultaneity problems that are especially obvious in the context of fast evolving financial markets on the one hand and slowly reacting fundamentals on the other hand. Moreover, we argue that speculation is too complex a phenomenon in order to be represented by a single variable. Monetary policy, as a third important inconvenience, is difficult to be represented by a variable that is
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not anticipated by agents. To support empirical evidence, we consider the role of inventories as an approximation for speculative activity.

Two problems with monetary policy and the crude oil market arise from the preceding analysis: economic and financial instability; and a higher oil intensity of the economy implying a threat for the natural environment. In Part III, we address political answers for these problems. Chapter 5 debates existing policy propositions that are already partially realized in some cases. Some approaches address only the stability issue while others take only the ecological problem into account. In particular, we discuss futures market regulation and the use of the US strategic petroleum reserve in order to ensure price stability. With respect to environmental policy, a carbon emission trading system and an energy tax are frequently proposed in policy debates. We apply both ideas to the crude oil market and assess the resulting implications. All these propositions are successful in achieving the policy goals partially. However, they share shortcomings as they are not sufficient to guarantee stability and sustainability, and sometimes may even give rise to new problems.

For these reasons, a new approach is taken in Chapter 6. It aims at bringing together the advantages of each of the existing policy propositions while avoiding their drawbacks. Specifically, it must be an approach that is able to establish economic and financial stability as well as ecological sustainability without creating new macroeconomic problems. The idea we present in this chapter is unconventional. It does not try to eliminate financial market disturbances. Rather, a design of coordinated monetary and fiscal policy makes use of the existence of futures markets to lead the crude oil market and, in some measure, the economy as a whole to a stable and sustainable environment. We call it the ‘oil price targeting system’.