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U.S. industry-level returns and oil prices

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ABSTRACT

This paper empirically investigates and provides further support for the oil price effect documented in Driesprong et al. (2008) in the U.S. industry-level returns. We find that oil price predictability is concentrated in a relatively small number of industry-level returns, the relevant measure for a study of the oil effect is percentage change in oil spot prices, and changes in oil futures prices have virtually no prediction power for industry-level returns. With percentage changes in oil spot prices as the predictor, approximately one fifth of industry returns are oil-predictable. We detect a two trading weeks delay in reaction to oil price changes which is consistent with the Hong and Stein (1996) underreaction hypothesis. These results are robust to various alternative specifications, and are shown to be unrelated to time-varying risk premia. Moreover, we demonstrate that trading strategies based on the oil effect generate superior gains in comparison with buy-and-hold strategy in the presence of reasonable trading costs.

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1. Introduction

Driesprong et al. (2008) show that changes in oil prices can predict index returns for approximately 32% of all international equity markets and 63% of developed markets. They document the relatively short duration of this effect, its independence from time-varying risk premia, and gains from an oil-based active trading strategy in the presence of reasonable trading costs.[2] Driesprong et al. show that this remarkable finding is due to delayed reaction by a significant number of market participants in response to changes in oil prices. The fact that oil prices, which are widely and freely available and are closely followed by market participants and scholars, contain information which can be used to predict index returns and generate significant gains in active trading, is an interesting result for both practitioners and financial researchers and hence deserves further investigation.

In our work, using industry-level returns data for the U.S., we show that oil predictability is concentrated in a relatively small percentage of industries. We find that changes in oil spot prices predict approximately 20% of industry returns, while changes in oil futures prices have very weak prediction power.[3] A delayed reaction of two trading weeks, or between six and ten trading days, is detectable in the data, which confirms the findings of Driesprong et al. We also show that the negative impact of oil price changes at industry-level can not be statistically ruled out for the cross-section of returns. Based on this fact, we document

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[2] Driesprong et al. (2008) find oil predictability effect to be in place for approximately one month. We find a similar duration.

[3] This result is based on statistically significant parameter estimates at 10% or better level, using oil price change as the predictive regressor. We observe that oil price changes "Granger cause" a higher percentage of industry returns.

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the potential positive gains from an oil-based strategy in comparison with buy and hold, in the presence of reasonable trading costs. We carried out extensive robustness testing for model mis-specification, omitted variables, and inclusion of the usual financial and economic factors. Thus, our results provide additional support for the oil effect discussed by Driesprong et al.

Driesprong et al. findings imply gains from active trading using oil-based strategies. It would be useful to isolate the source of predictability observed at the index-level returns for disaggregated, industry-level data for further research or decision making, such as design of trading strategies. Detailed industry-level data are not available for all markets in Driesprong et al. study, but they are available for the U.S. This is the reason for our focus on the U.S. industry-level data.

In order to exploit the oil effect in research or in practice, it is necessary to know which measure of oil price changes has reasonable prediction power at the disaggregated level. The study by Driesprong et al. focuses on two measures, percentage changes in spot oil prices and percentage changes in futures prices for sweet crude oil. We find that spot oil price changes are superior to oil futures for prediction purpose.

The claim for existence of an oil effect may initially seem at odds with the rationality of market participant behavior and efficiency of financial markets. But Driesprong at al. successfully justify the oil effect based on a variation of Hong and Stein (1996) underreaction hypothesis, which reconciles their findings with the observation by many economists that investors, rather than possessing unlimited-processing capacity, are better characterized as being only boundedly rational; see Shiller (2000). Few traders pay attention to all sources of information or even understand their impact on the prices of the assets that they trade; see Hong et al. (2007). Specifically, Driesprong et al. use an empirical testing procedure based on the Hong et al. delayed reaction to newly available information. We follow this testing procedure to show that our results are empirically consistent with the underreaction hypothesis. Driesprong et al. claim that sectors in which the impact of oil prices is likely to be a dominant first-order effect, show less predictability, but sectors where oil impact seems to be a second-order impact, demonstrate a more pronounced oil effect. We explore this assertion much deeper and find strong empirical support for their claim. In this respect, Driesprong et al. and our findings are in sharp contrast with Huang et al. (1996), who find significant information links between oil futures market and especially energy sector, using daily data.

Our work contributes to the literature on equity returns predictability, an active area of research since the 1980s. Predictability is an important subject, since a model with even very modest prediction power for asset returns can potentially be used to generate significant profits. Early and influential examples include Fama and French (1988), Campbell and Shiller (1988a), and Campbell and Shiller (1988b). More recent examples include Campbell and Yogo, (2006) and Campbell and Thompson (2008), among many others. These studies examine predictability based on valuation ratios. They typically conclude that valuation ratios are positively correlated with subsequent returns and the implied predictability increases as prediction horizon becomes longer. A related and sizeable literature studies the ability of macroeconomic quantities in predicting equity returns. Important examples include Chen et al. (1986) and Fama and French (1993), among many others. We replace valuation ratios or macroeconomic variables with changes in oil prices and study the ability of the resulting statistical model in predicting industry returns.

We provide an empirical link between the return predictability literature, especially return predictability based on macroeconomic factors, on one hand, and oil and the macroeconomy literature on the other hand. The economics profession accepts a link between oil prices, macroeconomic variables, and business cycles since the seminal work of Hamilton (1983). More recent examples include Lee and Ni (2002), Hamilton (2003), Hamilton (2009), and Ravazzolo and Rothman (2010) among others.[4] Moreover, macro-finance literature accepts a link between business cycles and equity returns or equity premium at the aggregate level or at the cross-section of the returns; see Cochrane (2008) for a detailed discussion. As a result, it is important to study whether a variable such as oil price, which has considerable power in predicting and explaining business cycles in the post World War II U.S. data, has any prediction power for series such as equity returns which are closely related to business cycles. Moreover, there is a strong presumption in the financial press that oil prices strongly influence the stock market behavior. Yet, relatively few studies examine prediction power of oil prices for equity returns.

In general, before Driesprong et al. (2008), the empirical evidence on the impact of oil price fluctuations on stock prices was viewed as mixed. Chen et al. (1986) specifically include monthly changes of the real price of oil in their analysis, but find no evidence of a statistically significant relationship between unconditional returns and oil price changes.[5]Jones and Kaul (1996) study the reaction of stock prices to oil shocks, and find mixed evidence on the ability of the impact of oil shocks on real cash flows to explain the behavior of stock prices. Huang et al. (1996) study information flow between oil futures market and equity markets. Their study shows that to a large extent, stock markets and oil futures market are contemporaneously correlated. Odusami (2009) is an example of studies that examine the impact of unanticipated shocks on aggregate U.S. stock market returns. This study uses a variant of Jump-GARCH model, where jumps are driven by events in the oil market. In a similar study, Hammoudeh and Malik (2007) study the volatility transmission mechanisms in the oil market and in U.S. and Persian Gulf region equity markets. Aleisa et al. (2004) study the relationship between oil prices and oil industry index returns. In a more general study, Cauchie et al. (2004) investigate the determinants of equity returns in emerging and small open economies. Among such determinants, they study the role of commodity prices.

In a study similar to Driesprong et al. and ours, Hong et al. (2007) find that sixteen industry returns, including the petroleum industry, can generate statistically significant one or two month ahead predictions of aggregate market returns for the U.S. and a group of developed economies. They show that high returns for the petroleum industry predict lower returns for the U.S. stock market. Kilian and Park (2009) find that the response of aggregate U.S. real stock returns may differ greatly depending on

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[4] Hooker (1996) argues that the oil price-macroeconomy relationship has changed and weakened in recent years.

[5] They use wholesale oil price data which is very smooth and actually remains constant for extended periods well into the 1980s. This smoothness is misleading for empirical tests concerning monthly changes in oil prices and asset returns. Thus their choice of oil price variable, in our opinion, has some problems.

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