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## Striking oil: Another puzzle? ☆

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## ABSTRACT

Changes in oil prices predict stock market returns worldwide. We find significant predictability in both developed and emerging markets. These results cannot be explained by time-varying risk premia as oil price changes also significantly predict negative excess returns. Investors seem to underreact to information in the price of oil. A rise in oil prices drastically lowers future stock returns. Consistent with the hypothesis of a delayed reaction by investors, the relation between monthly stock returns and lagged monthly oil price changes strengthens once we introduce lags of several trading days between monthly stock returns and lagged monthly oil price changes.

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## 1. Introduction

Oil prices did not fluctuate much before 1973. A few large U.S. oil companies known as the *Seven Sisters* stabilized the price through price and production controls during much of the 20th century. After the Yom Kippur War started on October 6, 1973, control over crude oil prices passed from the United States to OPEC. Since then

oil prices started to behave like the prices of other commodities (see Fig. 1).

The impact of oil price changes on the world economy is large. According to Adelman (1993, p. 537), “Oil is so significant in the international economy that forecasts of economic growth are routinely qualified with the caveat: ‘Provided there is no oil shock.’” The International Monetary Fund (2000) estimates that a US\$5 per barrel price increase reduces global economic growth by 0.3% in the following year. While numerous studies focus on the effects of oil price changes on the economy (recent examples include Hooker, 1999; Hamilton, 2003; Hammes and Wills, 2005) few studies analyze the relationship between oil prices and stock market prices. Exceptions are studies by Chen, Roll, and Ross (1986), Ferson and Campbell (1993) and Jones and Kaul (1996), which investigate whether oil price risk is priced in stock markets. Even more surprisingly, the question of whether oil prices forecast future stock market returns has, to the best of our knowledge, received no attention in the

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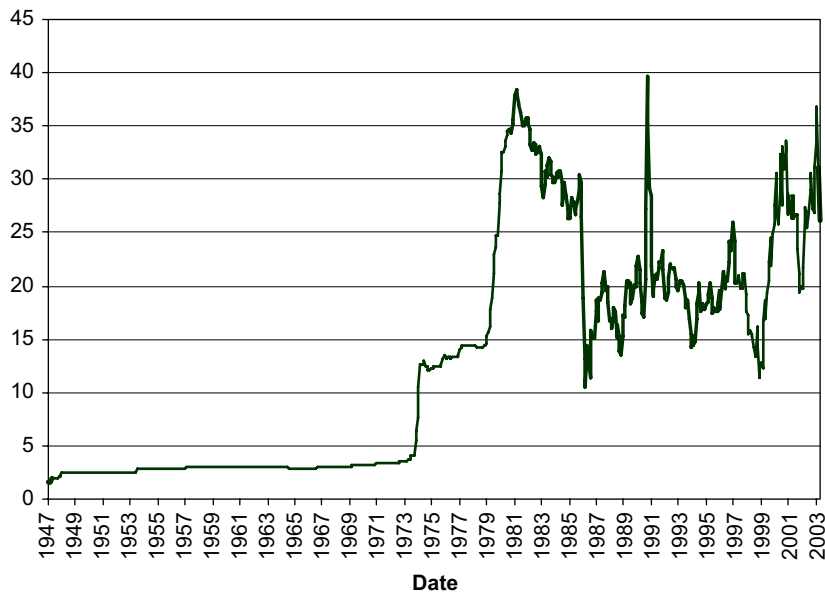


Fig. 1. West Texas Intermediate Oil Price (US\$/Barrel) from 1947 to 2003. Source: Global Financial Data Inc.

literature. Jones and Kaul (1996) suggest that oil price changes might forecast stock market returns, but leave the issue for further research.

This paper investigates whether changes in oil prices predict stock returns. Using stock market data from 48 countries, a world market index, and price series of several types of oil, we find that they do. Stock returns tend to be lower after oil price increases and higher if the oil price falls in the previous month. This predictability is not only statistically significant but also economically significant in many countries, and in the world market index. For instance, an oil price shock of one standard deviation (around 10%) predictably lowers world market returns by 1%. We test two hypotheses for these predictability results. One explanation, frequently offered for stock market return predictability based on economic variables, is that such is a result of time-varying risk premia. We find no evidence to support this hypothesis. Rather, our evidence is consistent with an underreaction hypothesis, as it appears to take time before information about oil price changes becomes fully reflected in stock market prices. At first sight this result might seem surprising. Assuming market efficiency, one would expect that information in oil prices is precisely the type of information that would almost surely and immediately be incorporated into stock market prices. Traders all over the world can observe oil prices easily at no cost and on a real time basis. In addition, the price of oil is one of the most important macroeconomic factors in the world economy. Nonetheless, we show that even though the price of oil is public information, our findings might be explained using the gradual information diffusion hypothesis proposed by Hong and Stein (1999). They show that underreaction can occur when investors have difficulty in assessing the impact of information on the

value of stocks, or alternatively, when investors react to information at different points in time. Our evidence supports this gradual information diffusion hypothesis. Most notably, when we introduce lags of several trading days between the monthly stock returns and lagged monthly oil price changes, this substantially strengthens the predictability relation. In addition, the predictability effect is more pronounced in sectors where the economic impact of oil price changes is more difficult to infer. Oil sectors, or sectors in which the impact of oil prices is likely to be a dominant first-order effect, show less predictability.

Our paper makes two important contributions to the literature. First, we are the first to document statistically and economically significant predictability of stock returns using oil price changes. Second, we find that the predictability of stock market returns based on oil price changes does qualify as truly anomalous as it cannot be attributed to time-varying risk premia. There is a large literature on the predictability of stock market returns as a consequence of time varying risk premia. Schwert (2003) provides numerous sources. In our case one argument against time-varying risk premia is that in equilibrium higher oil prices should predict higher future stock market returns as oil price shocks increase uncertainty. However, the effect goes the other way: higher oil prices lower future stock returns. Schwert (2003) states that, as an extreme standard, when predictability is not the result of time-varying equilibrium returns, there should be evidence that excess stock returns are predictably negative. He points out that the well-known anomalies documented to date do not meet this extreme standard. Predictability for these variables is generally restricted to positive excess returns only. The predictability of stock returns using oil price changes also meets this standard. Oil price changes

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