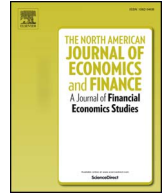
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## Cross herding between American industries and the oil market

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### ABSTRACT

This paper contributes to the debate on the cross-markets correlation by extending tests of herding behavior between the stock market and the crude oil market. We study herding behavior at the sector level during extreme oil market movements. Furthermore, we investigate the cross herding behavior between the two markets while including the volatility of the oil prices and investors' sentiment. We use a modified version of the cross section absolute deviation model to infer the impact of the oil market on industry herding. Our database covers a sample of all U.S. stocks from January 2000 to December 2017 on a daily basis. The results indicate that industry herding is absent in all sectors. However, when considering the extreme oil market movements, the results suggest that sector herding is more pronounced during oil market downturns than upturns. Moreover, we find that the oil market volatility and investors' sentiment reduce the industry herding. Our findings suggest that the herding is strongly related to the information in the oil market. In fact, investors use this information as trading signals, which affect their collective behavior. When the fear sentiment is high, investors do not follow the market consensus, but rather their own information making independent decisions.

### 1. Introduction

Herding behavior in financial markets is commonly defined as the tendency that a group of investors follows the actions of others. Specifically, [Welch \(1992\)](#) defined herding as a correlated behavior between the individuals. [Avery and Zemsky \(1998\)](#) defined herding as a suppression of individual opinions in favor of the direction of the crowd.

Understanding herding behavior is crucial for financial researchers, because it helps understanding the way information is incorporated into prices. In fact, many empirical studies stress out that herding leads to excess market volatility, and may cause market instability, which makes prices to diverge from their equilibrium values (see, for instance, [Shiller, 1990](#); [Furman and Stiglitz, 1998](#); [Morris and Shin, 1999](#); among others).

[Banerjee \(1992\)](#) and [Bikhchandani, Hirshleifer, and Welch \(1992\)](#) held the first theoretical study of herding behavior. A growing body of empirical literature, has appeared since, and examined herding in different markets and under different circumstances (see, [Lakonishok, Shleifer, & Vishny, 1992](#); [Christie and Huang, 1995](#); [Chang et al. \(2000\)](#); [Chiang and Zheng 2010](#), [Xie, Xu, & Zhang, 2015](#); [Zheng, Li, & Chiang, 2017](#); among others).

Although the abovementioned studies differ in inspecting the herding behavior by the context or the market's conditions, they are confined to the aggregate market level and lack of a systematic analysis at the industrial level. In fact, a growing body of literature suggests that herding may differ across sectors. For instance, [Henker, Henker, and Mitsios \(2006\)](#) found that industries such as materials, consumer staples and financials exhibit a significant herding behavior than other industries. [Lee, Chen, and Hsieh \(2013\)](#)

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found that herding in the information Technology plays an important role in explaining herding for other sectors in China. Gebka and Wohar (2013) reported that herding is more prevalent in the Basic Materials, Consumer Services, and Oil & Gas industries. Dehghani and Sopian (2014) found that herding behavior is limited to the Technology sector. Litimi, BenSaïda, and Bouraoui (2016) showed that herding is generated during turmoil periods in 6 sectors out of 12 (Consumer non-durables, Energy, Health care, Public utilities, Technology, and Transportation). BenSaïda (2017) reported that herding behavior is more prevalent during financial distress periods in 10 sectors out of 12. Similarly, Zheng et al. (2017) examined herding behavior at the industry level for nine Asian markets, and found that herding is more widespread in the Technology and Financial industries, but weaker in the Utility sector. Litimi (2017) investigated herding in the French stock market, and found that investors embark into a collective movement only in some sectors with different herding triggers.

While, these studies provide significant results of sector herding, they do not provide a consistent understanding of the industry herding. Thus, some questions remain unanswered. More precisely, in analyzing herding activities over the aggregate stock market, we question whether investors herd around other markets consensus such as commodities markets.

In fact, it has been documented in the literature that stocks and commodities are highly integrated (see, Jones and Kaul, 1996; Sadorsky, 1999; Greer, 2000; Gilbert, 2009; among others). For instance, Jones and Kaul (1996) studied the relationship between the oil price shocks on the U.S. and the Canadian stock market, in the post war period, and found a negative relationship. Sadorsky (1999) studied the relationship between stock prices and oil prices in a vector autoregressive (VAR) model, and found a significant relationship between the oil market and a set of several variables of the stock market, such as, short-term interest rate and industrial production. Greer (2000) reported a significant negative correlation of commodity index returns with stocks and bonds for the period that spans from 1970 to 1999. Other studies, such as Gorton and Rowenhorst (2006) and Erb and Harvey (2006), reported similar findings. Chiou and Lee (2009) inspected the relationship between the WTI prices and the S&P 500 index prices, and found that oil prices' movements have a significant impact on stock prices. Meanwhile, Choi and Hammoudeh (2010) studied the link between the S &P 500 and several commodity prices (Brent oil, WTI oil, copper, gold and silver) and found that commodity prices have a significant impact on stock markets portfolios.

Due to the significant effect of commodity prices on equity markets (see, Wen, Wei, & Huang, 2012; Büyükaşahin and Robe, 2014; Tang and Xiong, 2012; among others) we can argue that herding behavior in the stock market may be driven by financial investors moving across markets. Moreover, adding support to this view, Büyükaşahin, Haigh, and Robe (2010) reported that commodities markets and stock markets could move like "a market of one" in periods of fluctuations and high volatility. Based on the aforementioned empirical evidence on the interaction between commodities and stock prices, we shall need more evidence about the cross relationship between the two markets. To the best of our knowledge, despite the growing empirical literature on the correlation between commodities markets and the stock market, no study had inspected the cross herding behavior between the two markets. Moreover, few studies inspected the herding behavior in commodities markets and found conflicting results (see, Wiener, 2006; Gilbert, 2009; Chunrong, Chatrah, & Song, 2006, Steen and Gjolberg, 2013).

The crude oil is an important variable in the world economy and it affects several sectors such as, Transportation, heating, productions. As such, fluctuations in oil prices can have important repercussions on other sectors and may affect stock prices. For these reasons, it is very probable that herding in the stock market is driven by the global financial crises transmitted through the contagion of behavior between the stock market and the crude oil market.

Dennis and Strickland (2002), Luo (2003), and Gabaix, Parameswaran, Vasiliki, and Eugene (2006) supposed that herding might trigger excess volatility and make prices to deviate from their fundamentals. In fact, Friedman (1953) supposed that irrational investors destabilize prices and cause excess volatility. Froot, David, and Jeremy (1992) and Avramov, Chordia, and A. & Goyl A. (2006) reported that the tendency to imitate each other might cause excess volatility. Meanwhile, Blasco, Corredor, and Ferreruela (2012), Balcilar, Demirer, and Hammoudeh (2014), Huang, Lin, and Yang (2015), Boubaker, Farag, and Nguyen (2015) and BenSaïda (2017) explored the relationship between herding and the idiosyncratic volatility and found that herding triggers market volatility.

Another strand of empirical literature, stress the significant impact of investors' sentiment on herding behavior. In fact, according to the psychology literature, investors' sentiment affects their decision about future cash flow. It is documented that investors with positive sentiment make optimistic choices, whereas, those with negative sentiment make pessimistic choices (see for example, Bower, 1981; Arkes, Herren, & Isen, 1988; Wright and Bower, 1992; among others). Since the investors' sentiment measures the emotional part of capital market, we expect it to influence herding behavior. Baker and Wurgler (2006) found that investors' sentiment and market returns are significantly related. Litimi et al. (2016) found that investor sentiment actively contributes to the intensity of herding.

Motivated by the abovementioned studies, this paper contributes to the literature in many aspects. First, we study herding behavior at the sector level. Second, we examine the possible cross-herding behavior between the oil market and the stock market. More precisely, we investigate the impact of oil prices on sector herding while including the extreme oil prices movements. Finally, we examine the impact of the investors' sentiment and the volatility of the oil market on the industry herding.

The remainder of this paper is organized as follows. Section 2 presents the data and methodology. Section 3 summarizes the main results. Section 4 concludes the paper.

## 2. Data and methodology

### 2.1. Data

Our sample covers daily returns of all domestic U.S. firms listed on NYSE/AMEX/NASDAQ for the period that spans from January

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