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Article

COVID 19 AND HERDING BEHAVIOUR: EVIDENCE FROM INDIAN METAL COMMODITY DERIVATIVE MARKET

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Abstract

The commodity market is gaining the attention of the investor community due to its diversification and hedging properties, and commodity derivatives constitute a major portion of the total products traded in the Asian market. The present study looks into the herding in the metal commodity sector during COVID-19 using the daily closing prices of seven metal commodity derivative markets from January 2020 to December 2020. Quantile regression is used to test the standard herding equation at different quantiles, representing normal and extreme market movement. It was found that there is a presence of herding under normal market conditions, during COVID-19. Herding is absent during extreme market movement in both bull and bear markets. It was concluded that investors tend to mimic other investors during the uncertainty periods, but the investor sentiments are less during extreme market movement. The study also shed light on the hedging and safe-haven properties of the metals, especially precious metals like gold, which help investors make rational decisions in extreme market conditions. The study has implications for policymakers and investors.

Keywords: *commodity market, covid19, herding, quantile regression*

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Abstract

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Introduction

Commodities are always a traditional favourite for investors due to their significance in portfolio risk management, risk aversion strategies, and asset allocation. It has gained momentum after financialization as a popular diversification and hedging tool (Babalos et al., 2015). Among commodities, metal commodities are an imperative segment for both emerging and developed markets since these markets rely on the export and import of metal commodities for the growth of their industries (Babalos et al., 2015). After equity derivatives, commodity derivatives are the most widely traded derivatives in the world, and in the case of Asian commodity markets, metal derivatives comprise about 55% of the total trading volume across the globe (Kumar et al., 2020). Hence it is evident that price changes of metal derivatives are an interesting area for the market participants as well as policymakers. The present COVID-19 pandemic is referred to as a "black swan" event since it accelerated the fear and worry of investors as the pandemic is unpredicted and has not occurred before (Yarovaya et al., 2021). The present crisis also affected the commodity especially, metal commodity market. Depending on the type of commodity, there is a substantial price change in the market due to the COVID-19 pandemic (Borgards et al., 2021). It is a widely accepted fact that commodity prices significantly reduced during Covid 19 except the price of gold. At the onset of COVID-19, metal prices went down, and the most significant drop was seen in zinc and copper (Ezeaku et al., 2021). As the COVID-19 threat continues to spread all over the global economy, liquidity of commodity investments was reduced, and volatility increased compared to other investments (Saches, 2020).

As a result of the ongoing crisis, there are behavioural anomalies in the market. One such popular anomaly is herding behavior, which can be explained against the efficient market hypothesis of Fama, 1970. Herding is a market-wide behavioural phenomenon where investors imitate the behaviour of other investors without taking into account available personal information (Kumar et al., 2020). They are taking a risky position without adequate knowledge about the market (Bikhchandani & Sharma, 2000). This particular phenomenon can lead to the co-movement of assets in the market (Pindyck and Rotemberg, 1990). The phenomenon is also a common pattern in the commodity market that will cause price changes and excess volatility (Hwang and Salmon, 2004). Unlike other markets, the commodity market has a self-correction mechanism where market traders overreact and move the prices based on sentiments, but rational traders put the prices in equilibrium through the fundamentals of demand and supply (Fishe and Smith, 2018). Hence, investors push the price away from market fundamentals, but it is only momentary in the commodity market. (Fishe and Smith, 2018).

Though there are studies available in the stock market during the COVID crisis (Aziz et al., 2020; Yang et al., 2020; Espinosa-Mendez and Arias, 2020), there are not many studies in the commodity market. The study addresses this gap by testing the herding behavior of metal commodity derivatives during the COVID-19 crisis. The study addresses the question of whether herding is present in the metal derivative market during COVID-19 and, if present, whether it is contingent upon market movements. The present study is motivated by the methodology followed by Marbun (2020) to find out the presence of herding in extreme stock market movement. Our study differs from theirs in such a way that the present study takes into account both conditional and unconditional herding behaviour to explore the effect of COVID-19 and also because the study is in a different context, i.e., the metal commodity derivative market. This study contributes to the existing literature in two ways. The present study will add to the literature that explains the financial impact of COVID-19. Also, it will contribute novel evidence to the literature on herding behavior in the commodity market, especially in the metal commodity sector, by taking into account the occurrence of herding for the period of COVID-19 in the metal commodity derivative sector.

Literature review

There is evidence of herding in different asset classes across different periods, and academicians and practitioners are giving much attention to this subject through high-quality studies. Specifically, there is empirical testing of herding in the stock markets (Chang et al., 2000; Caporale et al.,2008; Chiang and Zheng, 2010; Lie and Truong, 2014; Litimi et al., 2016;, Chauhan, 2020), bond markets (Cai et al., 2012; Galariotis et al., 2016, Koetsier and Bikker, 2021), commodities markets (Gleason et al., 2003;

Adrangi and Chatrath, 2008; Steen and Gjolberg, 2013; Babalos and Stavroyiannis, 2015; Schlender and Ceretta, 2015; BenMabrouk and Litimi, 2018, Kumar et al., 2021), digital currency market (Kyriazis, 2020) mutual funds and pension funds (Bauer et al., 2018; Deng et al., 2018), house market (Ngene et al., 2017), sectoral herding (Cakan and Balagyozyan, 2014; Cakan, 2015; Cakan and Balagyozyan, 2016) and REITs (Philippas et al., 2013). Herding in the commodity market is less studied as compared to the stock market and provides mixed and inconclusive results (Babalos et al., 2015; Pierdzioch et al.,2013; Boyd et al., 2016; Demirer et al., 2015).

There are differences in opinions about herding (Gjolberg and Steen, 2013), while other studies found "anti-herding behavior" in metal and oil markets (Pierdzioch et al., 2013). Gębka and Whoar (2013) defined "anti-herding as a phenomenon in which investors overemphasize either their own views or the views of a subset of other market players, leading to an increase in cross-sectional dispersion." It is therefore essential to extend the study to herding in the metal commodity markets.The herding behavior of investors is an interesting area to investigate during a crisis since investors may share similar worry and fear and be vulnerable to financial losses (Yarovaya et al., 2021). However, there is a limited amount of literature that studies herding during the COVID-19 crisis. Babalos and Stavroyiannis (2015), in their study, found a pattern of herd behavior during the global financial crisis in the European commodity market.

Methodology

The present study aims to detect herding behaviour in the metal commodity derivative market during COVID-19. The study also seeks an answer to the question of whether there is herding during extreme market movements. The study is based on historical data collected from the website of the Multi Commodity Exchange of India Ltd. (MCX). According to Lao and Singh (2011), herding can be considered a short-lived occurrence. Hence, the present study utilizes daily frequency data, and thereby, it is possible to examine herding even in a short period. The daily closing prices of seven metal commodity derivatives (both futures and options) such as Gold, Silver, Aluminum, Copper, Lead, Zinc, and Nickel for the period 31st January 2020 to 31st December 2020, representing the period of the COVID-19 pandemic, were taken into consideration for the purpose of computing the return on each metal commodity derivative. The return of each derivative was computed using the following formula:

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right) \times 100$$

Herding occurs in the market, especially during high-volatility markets, when investors tend to follow the trends of the overall market rather than the information available about investment assets with them (Gleason, 2003). If herding is present in the market individual returns congregate to, the aggregate market returns. This will decrease the dispersion of individual returns from market returns. The return dispersion can be measured using the Cross-Sectional Absolute Deviation (CSAD) developed by Chang et al. (2000). Previously, Christie and Huang (1995) examined herding behavior by employing the Cross-Sectional Standard Deviation of returns (CSSD), which has certain drawbacks. Sensitivity of the measure to outliers is one of the drawbacks, and also extreme market selection is based on an arbitrary value. CSAD overcomes these drawbacks, and it has been recently used in several papers (Demirer et al., 2015; Arjoon and Shekhar (2017) examined herding in the context of the frontier market, empirically tested for herding commodity financialization settings. As such, the equation for estimating CSAD is

$$CSAD_t = \frac{\sum_{i=1}^{N} \left| R_{i,t} - R_{m,t} \right|}{N}$$

Where CSADt stands for Cross Sectional Absolute Deviation means the return dispersion of the individual derivative from market metal derivative returns on a given day t, Ri, t refers to the each derivative's return on a given day t. R m, t represents the returns of all metal derivatives taken on average and cross-sectionally on a given day t, and N stands for the total number of metal derivatives on a given day t.

In the opinion of Chang, et al. (2000), the relation between Rm, t and CSADt needs to be evaluated to detect the presence of herding since it is not possible to measure herding behavior using CSAD. Thus,

to examine herd behavior in the metal commodity derivative market, the present study used the following regression model advocated by Chang et al. (2000):

$$CSAD_t = \alpha + \gamma_1 |R_{m,t}| + \gamma_2 R^2_{m,t} + \varepsilon_t$$

Where Rm, t is the average market return and CSADt is the cross-sectional absolute deviation. The study uses median quantile regression analysis in R packages to estimate the relationship between Rm,t and CSADt during Covid 19 (at 50 % quantile), and also the tail dependence during extreme market movements at 1% and 5% quantile (bear market) and 95% and 99% quantile (bull market).

According to Chang et al., (2000), if the herding occurs, the relationship between return dispersion as measured by CSAD and aggregate market return measured by Rm, t will be nonlinear. The occurrence of herding is indicated by the coefficient γ2 having a significantly negative value (Mobarek et al., 2014). This provides evidence for herding in the market (Economou et al., 2018). As opposed to this, if herd behavior is absent, γ1 will be positive and γ2 will be either positive or zero (Mobarek et al., 2014). Hence, the hypothesis for the present study will be

H0: In the absence of herding effects, y1> 0 and y2 <0.

H1: If herding effects are present, y1>0, y2 >=0

Results and Discussion

Table 1 provides descriptive statistics results of the CSAD and average market return of the metal commodity derivative market, consisting of futures and options on copper, silver, gold, zinc, lead and nickel in the Indian metal commodity market for the period 1st January 2020 to 31st December 2020.

Table 1. Descriptive statistics

Measure/variables	CSAD	Return
Observations	257	257
Mean	17.85528	21.13152
Standard Deviation	30.407	36.415
Maximum	163.75248	196.90485
Minimum	0.00555	0.00721
Skewness	2.932	2.981
Kurtosis	9.213	9.540
Shapiro Wilk test	0.582*	0.587*

*Significant at 1% level

Table 1 shows the measures of the mean, skewness, standard deviation, kurtosis and Shapiro-Wilks test for normality. The average market return of the metal commodity derivative market is 21.13%. It is obvious that the present crisis has had less impact on the metal derivative market since the return is found to be better and the lower value (0.00721) didn't fall to negative even during the crisis period. Skewness and kurtosis statistics for CSAD and market return indicate that the distribution is not symmetric since skewness is different from zero and kurtosis exceeds three (Dhall and Singh, 2020). Also, positive skewness suggests the presence of more extreme gain than extreme loss during the crisis. There is a probability of greater extreme loss than profit during further movement, as indicated by kurtosis statistics that are greater than 3 (Chang et al., 2020). The Shapiro-Wilk test was found significant for both CSAD and market return and provides further evidence for the rejection of the null hypothesis of a normal distribution, which assures the use of CSAD over CSSD for finding out the herding behavior in the metal derivative market during the crisis.

Herding behavior in the metal derivative market during Covid 19 crisis

Quantile regression was employed to examine the presence of herding during normal market conditions and during extreme market movement for the study period. Since markets all over the world are feeling the impact of the COVID-19 crisis, there will be ups and downs in the price of the derivatives, as well as bull and bear markets. The normal market condition means there are up and down movements, but it doesn't indicate a bull or bear market. Median regression is used for examining the presence of herding behavior in the 50 percent quantile (normal market conditions). Since the investors' reactions are different during the bull and bear markets, the tail of the return distribution is employed to detect herding behavior. Quantiles of 1% and 5% were set up to obtain extreme downward movements, whereas 95% and 99% were set up to obtain extreme upward movements.

Table 2. Quantile Regression result

Market condition	Quantile	Intercept	γ_1	γ_2
Down	0.01	-3.38076	0.82118	0.00014
	0.05	-0.03209	0.77191	0.00030
Up	0.95	0.48551	0.85009	0.00002
	0.99	3.50843	0.78254	0.00040
Normal condition	0.50	-0.05646	0.86512	-0.00018*

*Significant at 1%

The result of the quantile regression model is presented in Table 2. The regression model is consistent with the theory postulated by Chang et al., (2000), which states that the relation between average market return and CSAD will be nonlinear when herding is present in the market. The regression model for each quantile gives different coefficients for y1 and y2. As evidence of herd behavior, it is essential to take the significant value of coefficient y2, since it is quadratic and y1 is linear. The presence of herding behavior can be ensured if the value of y2 is significantly negative. In the present study, the results demonstrate that during the COVID-19 crisis period and in normal market conditions, herd behaviour is evident in the metal derivative market since the y2 value is significantly negative at the 0.50 quantile, which represents the normal market condition. The scenario is different in terms of extreme market movement during COVID-19. The y2 value is positive in both the downward and upward quantiles, which means there is no herding in either the bull or bear market during COVID-19. In short, there is an absence of herd behaviour during extreme market moments (upper 99% and 96% and lower 1% and 5% market return observations). Investors do not follow each other in extreme market conditions but rather believe in their own information. But in the case of normal market conditions during COVID-19, there is the presence of herding and investors mimic the activity of other investors. They will profit from this action as well as avoid losses by following the example of other investors. The result of the present study during COVID-19 is in contrast to the study of Babalos et al. (2015), who reveal an absence of significant herding during the Financial Crisis of 2007-08. Also, the finding is contrary to the result of Lao and Singh (2011), who pointed out that the phenomenon is more intense in a bull market.

The finding is consistent with that of Kyriazis et al., 2021, who state that an increased level of volatility is favorable for the emergence of herding. Since the COVID-19 crisis has increased the volatility in the commodity market, it is a favorable situation for herding. It could be inferred that during normal ups and downs in the market, investors trust the action of other investors, whereas during extreme market movements, investors follow the market signal since the metals derivative market, especially precious metals, provides a rational signal to the investors about the uncertainty in the market. As the price of the underlying metal goes up, it indicates uncertainty in the market, and investors will usually take a rational decision to invest in the metal derivative market by believing in private information. When the price goes down, it is a signal of resolving uncertainty, and investors will take their own decisions without depending on others' actions. Also, similar to the findings of Kyriazis, 2021, the derivative market is less affected by investor sentiments and herding behavior is associated with advanced economies under extreme conditions. Information in the derivative market is effectively passed on, thereby reducing the need to follow other investors.

Conclusion

The present study looks into the herding in the metal commodity sector during COVID-19. The commodity market is gaining the attention of the investor community due to its diversification and hedging properties. Commodity derivatives constitute a major portion of the total number of derivatives traded in the Asian market. The COVID-19 has an impact on the financial market and volatility and liquidity were adversely affected. The herding phenomenon is particularly significant during periods of uncertainty, especially volatile periods. The present study employed the daily closing prices of seven metal commodity derivative markets from January 2020 to December 2020. Quantile regression is used to test the standard herding equation at different quantiles, representing normal and extreme market movement. During COVID-19, it was found that herding behavior is present under normal market conditions. Herding is absent for extreme market movement in bull and bear markets. It was concluded that investors tend to mimic other investors during the uncertainty period but the investor sentiments are less during

extreme market movement. The study also shed light on the hedging and safe-haven properties of the metals, especially precious metals like gold, which help investors make rational decisions in extreme market conditions. The study has some policy implications for investors and commodity derivative market authorities. The occurrence of herding in the commodity derivative market for the period of COVID-19 will lead to inefficiency, high volatility and deviation from the fundamental value in the derivative segment. Appropriate investment strategies should be implemented by the investors to benefit from the volatility and inefficiency created by herding. Commodity investors should be aware of the diminishing hedging and diversification properties of the derivatives due to herding during the COVID-19 period. But the market is less affected by investor sentiment during extreme conditions. Herding can further lead to bubbles in the market, which is of crucial importance to policymakers as they frame risk management strategies for reducing asset bubbles.

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Appendix

Table 1. Descriptive statistics

Measure/variables	CSAD	Return
Observations	257	257
Mean	17.85528	21.13152
Standard Deviation	30.407	36.415
Maximum	163.75248	196.90485
Minimum	0.00555	0.00721
Skewness	2.932	2.981
Kurtosis	9.213	9.540
Shapiro Wilk test	0.582*	0.587*

***Significant at 1% level**

Table 2. Quantile Regression result

Market condition	Quantile	Intercept	y_1	y_2
Down	0.01	-3.38076	0.82118	0.00014
	0.05	-0.03209	0.77191	0.00030
Up	0.95	0.48551	0.85009	0.00002
	0.99	3.50843	0.78254	0.00040
Normal condition	0.50	-0.05646	0.86512	-0.00018*