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Feedback Trading in Saffron Exchange Traded Funds

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Abstract

Commodity Exchange Traded Funds (ETF) are one type of ETF that underlying assets are agricultural products, energy or metals instead of stocks. These ETFs expose their investors to the market of various commodities in different ways, such as physical commodity, futures of single commodity, futures of baskets commodities, equities with exposures to commodities in various forms. In recent years, this financial instrument has become one of the important investment options among several people by creating many advantages. Despite these developments, scarce evidence exists in the current literature on the feedback trading of ETF investors. The objective of this paper is examination of feedback trading in behavior investors of Saffron ETF in Iran. For this purpose, daily data of two Saffron ETF for January 3, 2021 - Novenber 11, 2022 and Sentana and Wadhwani (1992) model was used. Empirical analysis suggests that volatility of fund return is symmetrical against the news. Despite a formal market with full overlapping for the underlying assets, Saffron ETFs investors do not notice about the difference between ETFs' market prices and their Net Asset Value (NAV). The results of the feedback trading model show that there is no evidence of feedback trading in Saffron ETF. It seems that the market of Saffron ETF is efficient, which can be related to the specificity of the underlying assets and the investors of these ETFs.

Keywords: Exchange traded fund, Feedback trading, Saffron commodity ETF

Introduction

Today, passive investment in two forms of open-ended index funds and exchange-traded funds has become an important part of the investment perspective in financial markets. ETFs are shorter-lived than index funds and were first introduced in the U.S. in January 1993 (Kallinterakis *et al.*, 2020). Demand for ETFs has grown markedly, making ETF trading one of the world's largest businesses with an estimated Net Asset Value (NAV) of US$10 billion and an annual growth rate of around 6% (WFE, 2022). ETFs have properties similar to that of mutual funds, and have an added feature of being listed and traded in the stock exchanges like shares (Mallika and Sulphey, 2018). ETFs set forth the diversification opportunities they provide to all types of investors at a lower transaction costs, but also highlight their tax efficiency, transparency and low management fees. All of these features rely on a specific in-kind creation and redemption principle. New shares can continuously be created by depositing a portfolio of stocks that closely approximates the holdings of the fund and similarly, investors can redeem outstanding ETF shares and receive the basket portfolio in return (Deville, 2008).

In recent years, this financial instrument has become one of the important investment options among traders by creating many

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advantages. Currently, various types of ETFs are traded around the world, So that by the end of the second quarter of 2022, the total number of ETFs in the world is 7,738 with a NAV of just over 8,522 billion $ (IIFA, 2022). Despite the when of ETFs in the world, this asset is divided into two general classes. The first class are divided based on the management structure and the second class based on the underlying assets (Deville, 2008). The first ETF was launched in August 2013 in Iran and after that, the process of entering these ETFs into the Tehran Stock Exchange (TSE) continued. At the moment, 109 ETFs are traded in TSE and total NAV of this ETFs has been at around 8 billion $ on November 2022 (Financial Information Processing of Iran (fipiran), 2022).

Commodity ETF are one of the types of ETF that underlying assets are agricultural products, energy or metals instead of stocks. These ETFs expose their investors to the market of various commodities in different ways, such as physical commodity, futures of single commodity, futures of baskets commodities, equities with exposures to commodities in various forms (Abner, 2016). The advantage of these ETFs is that, in addition to tracking the price of the underlying asset, it makes it possible to invest in a specific commodity, for any person and any amount of assets. At the moment, 9 commodity ETFs are traded in TSE and total NAV of this ETFs has been at around 2 billion $. This commodity ETFs are in two groups of agricultural products and precious metals, traded with two underlying assets, saffron and gold. The number and NAV of these ETFs are about 8% compared to Iran's ETF market. Despite various metal and agricultural commodities in Iran, the existence of these figures shows the low growth and acceptance of commodity ETFs in TSE, which requires further paper and investigation in the field of existing obstacles and problems and their resolution. Given the significance of these instruments, there has been a surging academic interest in the area with an increasing number of studies investigating various topics relating to ETF markets. Despite these developments, scarce evidence exists in the current literature on the trading and investment behavior (rational or irrational) of ETF investors. Intuitively, because of their ease and low cost of trading, ETFs may be appealing to individual (unsophisticated, uninformed) investors who are more likely to chase trends, raising a concern over the impact of their introduction on the overall market efficiency (Kallinterakis and Kaur, 2010). Evidence on the behavior of ETF traders has indicated that they subscribe to feedback style strategies. In an efficient market, free of arbitrage opportunities, the ETF value traded in the market must be equal to its NAV after adjusting for transaction costs (Da Costa *et al.*, 2019). The existence of arbitrators and a liquid market of shares and assets should result in small and temporary price differences between the share and its assets. However, in the context of ETFs, Chau *et al.* (2011) extended Sentana and Wadhwani (1992) model of feedback trading in an empirical analysis of the three largest ETFs in the U.S and found evidence of positive feedback trading, i.e., the existence of traders whose demand is based on the history of previous returns. However, these observations were made from data obtained in the already matured U.S market.

The purpose of this study is to investigate this issue, i.e., the existence of feedback trading in two saffron commodity ETFs in the Iran Mercantile Exchange (IME). Investing in these funds makes it possible for investors to buy and sell fund units immediately, in addition to supporting Iranian farmers and earning profit. Another notable feature of these funds is that they enable even new investors to participate in agricultural product markets without directly trading physical goods in traditional markets and assuming the associated risks. Instead, investors can buy and sell agricultural products in the form of commodity-based investment funds, which provides a more accessible and convenient avenue for investment. Feedback trading is a broad term in finance that describes the behavior of a specific type of trader whose investment decisions are influenced by historical price movements. This is played out by traders abandoning their own information and following that of the crowd−buying (or

selling) concurrently, as a result investors follow the same signal. The practice of feedback trading is founded upon the belief that previous price sequences accommodate discernible and recurrent patterns, which, if successfully identified, can be profitably exploited by assisting investors in predicting future price trends. The remainder of the paper is organized as follows. Section 2 briefly reviews the related literature and previous studies whit feedback trading. Section 3 describes the materials and methods. Section 4 presents and discusses the main experimental results and robustness checks. Finally, Section 5 presents the discussion and conclusions.

Literature review

Feedback trading arises when investors extrapolate previous price patterns. Positive feedback trading entails trading in the direction of the previous patterns−buying when prices rise or selling when prices fall. Negative feedback trading, in contrast, which is also referred to as a contrarian strategy, involves trading in the opposite direction of the previous price patterns − buying when prices fall or selling when prices rise (Kallinterakis and Leite Ferreira, 2007). For example, when the return of an asset is positive (negative) in the previous period, traders will buy (sell) that asset in the next period only considering the positive (negative) return of the previous period. The premise of both these strategies is that the prices maintain some sort of inertia as directional trends tend to persist over long periods of time (Farmer and Joshi, 2002). Positive feedback trading is considered particularly destabilizing as it drives prices away from their intrinsic values and contributes to substantial volatility. In contrast, negative feedback trading is largely viewed as stabilizing as it should bring asset prices back to their intrinsic value (Sentana and Wadhwani, 1992). The notion that leveraging past price patterns can be a lucrative trading strategy contradicts the efficient market hypothesis (EMH). The EMH posits that all available information, including historical price data, should already be incorporated into the current share price. Therefore, according to EMH, it is challenging to consistently profit from exploiting historical price patterns, as the market should have already adjusted for them. The EMH rests on the assumption that most investors are rational and as such, any irrational behavior which drives the price away from its intrinsic value will be arbitraged away rapidly by rational investors. Feedback trading may thus arise because of the irrational behavior of many investors. However, the possibility has also been expounded in the literature that feedback trading may be consistent with rational behavior (Charteris and Musadziruma, 2017). Investors have been found to be susceptible to certain behavioral biases meaning that they may fail to correctly interpret the market signals that they receive. Feedback trading can arise through the joint presence of the two factor: representativeness heuristic and the conservatism bias. The former occurs when an individual draws a conclusion about the general population by overweighting a sample of recent observations and consider it as representative for its properties, while the latter refers to the lagged response of investors to new evidence (Barberis *et al.*, 1998). Overconfidence, which incorporates the self-attribution and hindsight biases, has also been linked with positive feedback trading. For example, if an investor adopts a trading pattern, and certain events subsequently validate the effectiveness of that pattern, the investor might understandably feel a sense of pride. This is known as the self-attribution bias. Furthermore, if the price continues to follow the same trajectory, the investor may come to believe that they accurately predicted this pattern, assuming that others are now also following suit. This phenomenon is referred to as the hindsight bias. These biases can lead to more aggressive trading, which can reinforce existing positive feedback trading tendencies (Odean, 1999). While less common, negative feedback trading has also been linked with behavioral biases. For example, the disposition effect, which refers to the tendency of investors to hold on to shares that have not performed well for too long and sell shares that have performed well too quickly, leads to a reversal of the price trend

(Shefrin and Statman, 1985). Feedback trading can also stem from rational speculation based on expectations of price movements caused by feedback traders. Rational speculators, with an informational advantage, may try to exploit the trading patterns of the feedback traders and their susceptibility to behavioral biases. They do this by initiating a trend based on the available information before it becomes public and then maintain the trend by trying to exploit it. Effectively the rational speculators try to lure feedback traders to chase a trend by mirroring their behavior, to push prices up (or down), ride the bubble and then sell (or buy) the share just before its fundamentals are made available to the rest of the market. In so doing, rational investors will contribute to driving the price further away from its intrinsic value (De Long *et al*, 1990). Rational speculators who choose to use their informational advantage to profit from mispricing, without having instigated the trend in the first place, may also give rise to feedback trading. There are rational traders who trade on share fundamentals and are thus able to estimate any deviation of a share price from its intrinsic value. In such cases, these traders may decide to take advantage of this informational advantage by utilizing threshold-based trading rules to enter or exit the market. These thresholds enable the traders to exploit the mispricing up to the point where it is profitable for them to do so. This is often associated with the employment of stop-loss orders and portfolio insurance strategies and can be justified on the grounds of minimizing transactional costs (Farmer and Joshi, 2002). These strategies lead to sell decisions during market declines thus directly leading to feedback trading (Antoniou *et al*., 2005). That a portfolio insurance strategy can be entirely rational if an investor is risk averse. In such a case, a reduction in the price of a risky asset, caused by an exogenous factor, can lead to a larger reduction in the demand for that share (Sentana and Wadhwani, 1992).

Feedback trading is often considered a specific instance of herding behavior. Herding involves individuals aligning their actions with those of others. In the stock market context, this manifests as traders disregarding their own information and instead following the crowd, leading to simultaneous buying or selling actions. Consequently, investors tend to follow the same trading signals, contributing to herding behavior in the market. In the case of positive feedback trading, that signal is the lagged previous return. The two concepts, however, may be manifested simultaneously. That is, if investors engage in positive feedback trading, then a trend may be amplified if other investors choose to imitate their peers and herd on that trend. Conversely, if herding dominates then this will give rise to a trend in the market and those who wish to join the herd will be engaging in positive feedback trading (Kallinterakis and Leita Ferreira, 2007). The law of one price and the no-arbitrage argument suggest that the price of a basket of securities, such as an ETF, should be equal to the sum of its components' prices (Defusco *et al*., 2011). The price of an ETF in the market is determined based on supply and demand, known as the ETF market price. This price is not necessarily equal to the NAV of an ETF, and according to the market conditions, perspective of traders and value of underlying asset, it can be traded more or less than NAV. Establishing these conditions lead to the creation of price deviation and miss pricing, which provides the opportunity for arbitrage motive to rational speculators (Cherry, 2004). Several studies have been conducted regarding the price deviation and miss pricing of ETFs. For example, can be mentioned the study of Engel and Sarkar (2006), Devvil (2008), Johnson (2009), Ivanov (2013), Charteris *et al*. (2014), Purohit and Malhotra (2015), Dorfleitner *et al*. (2016) and Mallika and Sulphey (2018). In each of the mentioned studies, various factors related to the miss pricing have been mentioned, this has been fundamentally attributed to the non-synchronicity in trading between these ETFs and their underlying assets. According to Kallinterakis *et al*. (2020), the main factor in creating feedback trading in ETF is price deviation between the ETF and NAV. The existence of constant price deviation in ETFs leads to arbitrage opportunity, which requires

the simultaneous trading between the ETF market and the underlying asset. This issue cannot be applied to international ETFs whose trading market is outside the domestic borders, which do not have much overlap in trading hours. Wagner *et al*. (2022) studied feedback trading on US mutual fund in period (1995-2019). Results showed that return seasonality is due to unanticipated fund flow driven by uninformed (flow-motivated) retail investor trading. Active funds indicate flow-induced price pressure with a corresponding reversal of the effect, while passive funds suggest feedback trading instead. Karaa *et al*. (2021) studied feedback trading in Bitcoin using data from the period (2013-2019). Results demonstrated that feedback trading in the Bitcoin grows stronger at higher frequencies, for periods of higher sentiment and volume, and during hours corresponding to the trading hours of major Western stock exchanges. Charteris and Kallinterakis (2021) analyzed feedback trading in gold bullion coin market on South Africa for the March 1996 – August 2019 period. Positive feedback trading is present for the full sample period, before and during the crisis, interacting significantly with a variety of factors related to Krugerrand's pricing, yet dissipates post crisis, likely due to enhanced foreign demand that catapulted the coin's value, rendering it less easy to trade for South African retail investors. Kallinterakis *et al*. (2020) investigates whether feedback traders are active in US-listed country ETFs? Using a sample of nineteen country ETFs for the 2000-2019 window, they find that there are feedback trades in many of them, especially those targeting Asia-Pacific markets. A notable trading point is the broad feedback reported in the vast majority of country ETFs on days when there are successful premium/discount predictions, the fact that the country ETF premium/discount contains Useful information based on their trading dynamics. Chen and McMillan (2020) investigated the relationship between illiquidity, feedback trading and stock returns for several European markets using data (2006-2017) during the financial crisis and sovereign debt. The study results suggest that when price changes are more observable, due to low liquidity, then feedback trading increases. Therefore, during the crisis periods that afflicted European markets, the lower levels of liquidity prevalent led to an increase in feedback trading. Thus, negative liquidity shocks that led to a fall in stock prices were exacerbated by feedback trading. Da Costa *et al*. (2019) presented the results of a study on investor behavior in ETF markets using data for (2003-2012) in a sample of fifteen ETFs contracts in Brazil, South Africa, Korea, Mexico and India, as well as three ETFs contracts in the U.S. market. Their empirical analysis suggests that there is evidence of feedback trading in emerging markets such as Brazil, South Korea, Mexico and India, while there is no such evidence for the U.S. market. The results are consistent with the view that developed markets investors are prone to pursue fundamental driven investment strategies, while emerging markets investors appear to have informational guided behavior. Kyrkilis *et al*. (2018) studied feedback trading for three size-based stock portfolios of Athens Stock Exchange along with the short-term return dynamics during the Greek debt crisis period. Results showed positive feedback trading is an important component of the short-term return movements across the three stock portfolios receives significant support. Moreover, the volatility interdependence, both in magnitude and sign, is almost similar across the three models. Finally, bad news originating from the portfolio of small stock appears to have a higher impact on the volatility of large and medium size stock returns than good news during the Greek debt crisis period. Kuttu and Bokpin (2017) examined feedback trading in the markets of Ghana, Kenya, Nigeria and South Africa using weekly data for (1996-2015) window. They identified positive feedback trading on the South African market, with this trading more pervasive during market declines, with negative feedback trading dominant on the other markets. However, they attributed the finding of negative feedback trading to non-synchronous data rather than the reflection of contrarian traders in the markets.

By reviewing previous studies, specified that

feedback trading in financial markets is great importance as one of the behavior patterns of traders. Using the Sentana and Wadhwani (1992) model and a data set of Iran Saffron ETFs from January 2021 to November 2022, this paper attempts to address the by estimating the feedback trading behavior of Saffron ETF investors.

Materials and Methods

Feedback trading will be evidenced by autocorrelation in asset returns meaning that there is time dependency in returns – the return in the current period will be correlated with the previous period return. However feedback strategies are not commonly used by all investors, because the impact of feedback trading will be more complex than simple time dependency in the first moment of the series. The level of asset return, which indicates autocorrelation, is influenced by the return fluctuations, which indicates the level of risk in the market. An increase in volatility will give rise to an increase in the demand for assets by feedback traders and as such, feedback traders will have a greater effect on the share price, resulting in stronger autocorrelation in returns. In contrast, when volatility is low, the demand for shares by feedback traders will be low leading to lower autocorrelation. Secondly, the sign of autocorrelation depends on the type of feedback traders in the market, with positive feedback trading leading to negative serial correlation in returns while the opposite is true for negative feedback trading (Sentana and Wadhwani, 1992).

Sentana and Wadhwani (1992) model assumes the interaction of two groups of traders in the market. The first group consists of smart money investors, who maximize their expected utility, and second group comprises of feedback traders, who trade on the premises of previous return of ETF. Smart money investors rely on ETF principles and foundations and their behavior is characterized by risk aversion. The demand for ETF by the first group (smart money) investors in period t, is consistent with the maximization of expected mean-variance utility and can be given as follows:

$$Q_{1,t} = \frac{E_{t-1}(r_t - \alpha)}{\theta \delta_t^2} \quad (1)$$

In Eq. (1), where $Q_{1,t}$ is represents the fraction of stocks demanded by these investors, r_t ETF return in period t, E_{t-1} is the expectation in period t − 1 of the ETF's return r_t, in period t, α is the risk-free return, θ is the time-invariant coefficient of risk-aversion and δ^2 is the conditional variance (proxying for risk) at period t. The demand for ETF by the feedback traders is conditioned on the previous period's return as shown by:

$$Q_{2,t} = \gamma r_{t-1} \quad (2)$$

where $Q_{2,t}$ is the fraction of ETF demanded by these traders. As Eq. (2) suggests, feedback traders base their trades on the previous period's return, with the direction of their trades varying, depending on whether they positive. In addition, the coefficient γ may be the sum of positive and negative feedback. For the market to be in equilibrium, all ETFs must be held, in which case, that's mean $Q_{2,t} + Q_{1,t} = 1$ and combining this with Eqs. (1) and (2) yields the equilibrium condition:

$$E_{t-1} r_t = \alpha - \gamma r_{t-1} \theta \delta_t^2 + \theta \delta_t^2 \quad (3)$$

In Eq. (3), term $-\gamma r_{t-1} \theta \delta_t^2$ shown while its signal will depend on the signal of the feedback trading term γ, wherein positive feedback trading will have a negative autocorrelation, and vice versa. Assuming $r_t = E_{t-1} r_t + \varepsilon_t$, substituting (1) and (2) into (3) and rearranging gives:

$$r_t = \alpha - \gamma r_{t-1} \theta \delta_t^2 + \theta \delta_t^2 + \varepsilon_t \quad (4)$$

However, autocorrelation can be the result of both inefficiencies in the market (such as, for example, thin trading) as well as feedback traders and Eq. (4) does not allow us to disentangle between the two possibilities. To that end, Sentana and Wadhwani (1992) suggested the following ad hoc empirical specification of Eq. (5):

$$r_t = \alpha + \theta \delta_t^2 + (\emptyset_\circ + \emptyset_1 \delta_t^2) r_{t-1} + \varepsilon_t \quad (5)$$

Eq.(5) – which dub as basic model - distinguishes between the part of autocorrelation due to market inefficiencies (denoted by $\emptyset_\circ$) and that due to feedback trading (denoted by $\emptyset_1$), which $\emptyset_1 = -\theta\gamma$ significantly positive (negative) values for $\emptyset_1$

will denote the presence of negative (positive) feedback trading. If $\emptyset_1 < 0$, it suggests the presence of positive feedback trading while negative feedback trading would be associated with $\emptyset_1 > 0$. This equation shows that the first order autocorrelation of returns varies with the level of risk in the market, δ_t^2, and in the case that positive feedback trading is present, this will lead to negative autocorrelation in returns. To assess the presence of leverage effects in volatility, the conditional variance (δ_t^2) in all of the above equations follows an asymmetric GJR-GARCH specification:

$$+\lambda\,\delta_{t-1}^2 + \eta I_{t-1}\varepsilon_{t-1}^2\delta_t^2 = \omega + \beta\varepsilon_{t-1}^2 \qquad (6)$$

where ε_{t-1}^2 and δ_{t-1}^2 are the previous period's squared shock and conditional variance respectively, δ captures the asymmetric response of volatility following positive and negative innovations and I_{t-1} is a binary variable equal to one if $\varepsilon_{t-1} < 0$ or zero otherwise. If $\boldsymbol{\eta} > 0$ negative shocks increase volatility more than positive shocks of the same magnitude then the leverage effect is said to be present.

The data used in this paper include the daily observations of the closing prices and NAV values of two available Saffron ETF in IME. The data covers the period[1] between January 3th, 2021 and November 21th, 2022 and has been obtained closing prices from Tehran Securities Exchange Technology Management Co (Tsetmc) and NAV from Fipiran, with the observations from both databases matched. The WinRATS 8.0 and Excel software was used, daily continuously compounded returns for the ETF series were then calculated as Eq. (7):

$$R_t = \log(P_t - P_{t-1}) \qquad (7)$$

Also, Eq. (8) is used to calculate ETF price deviation from its NAV:

$$\frac{P_t - NAV_t}{NAV_t} \times 100 \qquad (8)$$

Results and Discussion

As mentioned in introduction, it was stated that currently only two saffron ETFs are traded in the IME. Table 1 presents some statistics on each ETF's percentage price deviation from its NAV contingent on their sign (premium, if the sign is positive; discount, if it is negative).

The average percentage deviation of ETFs' prices from their NAVs is negative for both ETF, denoting that Saffron ETFs traded on average at a discount during the full sample period. The negativity of the average price deviation means that Saharkhaiz and Novira trade 19.9% and 21.5% less than their NAV, respectively. During the review period, the amount of discounts of Saharkhiz ETF is -10.90 percent and Novira ETF is -7.07 percent. In this period, the average deviation of the positive price of Saharkhiz ETF is 3.94% and Novira ETF is 1.91%. This shows that when traders favor Saffron ETFs, Saharkhiz ETF was traded with a higher price deviation than Novira ETF. Versus, Novira ETF has been traded with less price deviation when traders are not lucky. In total, Saharkhaiz and Novira ETFs have sprayed 88 and 80% of their days with discount, and 12 and 20% of their days with premium, respectively. In total, Saharkhaiz and Novira ETFs spent 88% and 80% of days with discount, and 12% and 20% of days with premium, respectively. These statistics show that the traders of Saffron ETFs do not pay attention to the NAV of this funds, or, their NAV has not been determined correctly, which leads to a large price deviation in the market of these funds. The historical changes of the price deviation of Saffron ETFs are presented in Fig. 1.

Table 1- Statistics on percentage price deviation from NAV

1- The start trading of Novira and Saharkhaiz ETFs is 2021/01/03 and 2021/01/20 respectively. The beginning of the time period is 2021/01/03.

ETF	Average price deviation (%)	Average discount (%)	Average premium (%)	% of days when ETF trades at a discount	% of days when ETF trades at a premium
Saharkhiz	-9.19	-10.90	3.94	88.44	11.56
Novira	-5.21	-7.07	1.91	79.57	20.43

Source: Research findings

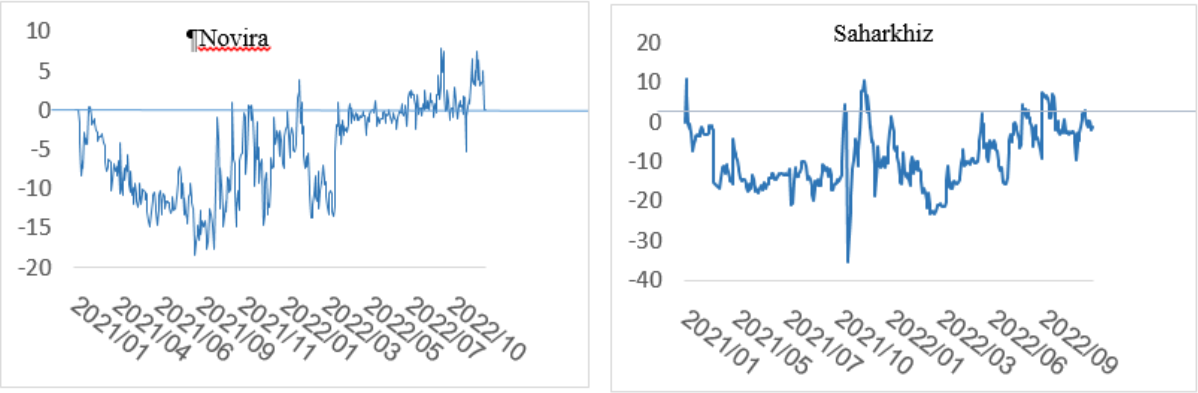

Figure 1- The historical changes of the price deviation of Saffron ETFs

Fig. 1. shows that on most days, both funds have discount. The highest amount of discount in Saharkhiz ETF is more than 35%. In the case of Novira ETF, this digit is more than 18%. Also, the highest premium in Saharkhiz ETF is more than 11% and in Novira ETF is 11%. Table 2 provides a series of descriptive statistics (mean, standard deviation, skewness kurtosis, Jarque-Bera normality test) pertaining to the log-differentiated returns of both ETFs.

Table 2- Descriptive statistics of Saffron ETFs

Statistics	ETF	
	Saharkhiz	Novira
Mean	0.14090	0.0992
Standard deviation	2.2994	2.3051
Maximum	8.9384	8.9160
Minimum	-8.8317	-9.5865
Skewness	0.5487	0.3027
Kurtosis	2.4363	2.2659
Jarque-Bera	126.1345	96.4905
Prob	0.0000	0.0000
Observations	424	421

Source: Research findings

Table 2 shows that during the reviewed period, Saharkhaiz ETF has provided its investors with a higher return than Novira ETF. The average return of Saharkhiz ETF is more than 0.14%, while this digit for Novira ETF is less than 0.10%. Both ETFs have positive skewness, which indicates the number of productive days compared to the number of days with positive returns. Also, the kurtosis of both ETFs is less than 3, which means that their distribution is shorter than the normal distribution. To examine the stationarity of Saffron ETFs, the Augmented Dickey-Fuller (ADF) unit root test has been used. The null hypothesis of this test is the existence of a uint root in ETF returns. If in this test, the computed value is greater than the critical value, the null hypothesis is rejected. Table 3 shows the results of ADF test statistic. According to the results, it is clear that the return of both Saffron ETFs in the level and whit existence intercept and trend are stationarity.

Table 3- Results of unit root test on Saffron ETFs (ADF)

ETF	Test type	Test level	t-statistic	Test critical values	Prob
Saharkhiz	Trend and intercept	Level	-14.92	-3.42	0.0000
Novira	Trend and intercept	Level	-14.86	-3.42	0.0000

Source: Research findings

ARCH test should be used to examine whether changes in ETF's current return depend on changes in the previous period or not. ARCH test is about the constant or variable variance of the error term. Before anything, it is necessary to perform the ARCH test on the variance of the error term. The ARCH tests the null hypothesis that no ARCH effects exist in the series and that it is an independently distributed series, the Results of ARCH test are given in Table 4.

Table 4- Results of ARCH test on Saffron ETFs

ETF	F-statistic	آمارهF	$LM = nR^2$	LM
Saharkhiz	54.27	0.0000	48.29	0.0000
Novira	99.45	0.0000	62.41	0.0000

Source: Research findings

According to the results of ARCH test in Table 4, the hypothesis of the existence of ARCH effects in the return of saffron ETFs cannot be rejected. As a result, both Saharkhiz and Novira ETFs have conditional heteroskedasticity. Now, according to the above results, the main model of Sentana and Wadhwani (1992) is estimated. The results of the estimation of the main model are indicated in Table 5.

Table 5- Parameter estimates for mean model with variance model GJR-GARCH

	Parameter estimates for mean Model				variance model Parameter estimates for			
ETF	α	θ	$\emptyset_0$	$\emptyset_1$	ω	β	λ	η
Saharkhiz	-0.085	0.052	-0.085	0.620	0.680	0.320	0.000	0.000
Prob	(0.542)	(0.551)	(0.886)	(0.867)	(0.024)	(0.297)	(0.663)	(0.607)
Novira	-0.076	0.030	0.191	0.005	0.411	0.767	0.140	0.025
Prob	(0.723)	(0.525)	(0.062)	(0.714)	(0.002)	(0.000)	(0.002)	(0.692)

Source: Research findings

According to results of Table 5, the volatilities of both ETFs do not respond significantly to news, with this response being symmetric in all cases, as the coefficient of η is always insignificantly. This means that positive and negative news have a uniform effect in increasing or decreasing the volatility in the return of Saffron ETFs. $\emptyset_1$ denoting the presence of feedback trading and it is not statistically significant for any of the Saffron ETFs. As a result, there is no evidence of feedback trading in Saffron ETFs, this means that the traders of this asset do not follow a specific pattern based on their previous return. Despit a formal market with full overlapping for the underlying assets, Saffron ETFs investors do not notice about the difference between ETFs' market prices and their NAVs and they trade only based on the supply and demand mechanism and market conditions. This is consistent with the results of Table 1 about the existence of a permanent price deviation between each ETF and its NAV. This findings are inconsistent with the findings of Wagner *et al*. (2022), Karra *et al*. (2021), Charteris and Kallinterakis (2021), Kallinterakis *et al*. (2020), Chen and McMillan (2020), Da Costa *et al*. (2019), Kyrkilis *et al*. (2018) and Kuttu and Bokpin (2017). $\emptyset_0$ indicates the existence of the return of ETFs based on market inefficiency that is not statistically significant for both ETFs, this means that the Saffron ETFs market is efficient. Due to the specificity of the underlying asset of these ETFs as the most expensive spice in the world, also, the food, medicinal and industrial

uses of saffron, its traders are a special part of investors in the market which is not only based on the previous return, rather they trade with the analysis and review of fundamental information. However, there are no Saffron ETF trading in any market in the world and Iran, as the largest producing country in the world, has the first Saffron ETF market.

Conclusion

Commodity ETF are one of the types of ETF that underlying assets are agricultural products, energy or metals instead of stocks. Evidence on the behavior of ETF traders has indicated that they subscribe to feedback style strategies. The objective of this paper is examine the feedback trading in behavior investors of Saffron ETF in Iran. For this purpose, daily data of two Saffron ETF for January 3, 2021 - November 11, 2022 and Sentana and Wadhwani (1992) was used. Examining the price deviation showed that these ETFs are traded at a price lower than their NAV on most trading days, and its traders do not pay attention to this difference. This situation shows the belief of most traders on the bubble of the underlying asset or pessimism about the performance of the ETFs. The results indicates positive and negative news have a uniform effect in increasing or decreasing the volatility in the return of Saffron ETFs. When information is published in the market of these ETFs, this news is more fundamental and traders are equally discriminating between published news. Also, results have no evidence of feedback trading in Saffron ETFs, and the traders of these ETFs do not pay attention to the previous day's return of these ETFs. It seems that the market of saffron ETFs in Iran is efficient and traders of these STFs are special part of investors, regardless of its previous return, they trade only based on the analysis and review of the available fundamental information. Since the trading of Saffron ETFs are not based on the feedback model, and traders do not only pay attention to the previous day's return, it is suggested that investors and portfolio managers use fundamental analysis and according to the factors influencing the price of Saffron, such as the amount of production, continental conditions, downturns and prosper and the export status of this product, trade and invest in these funds.

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معاملات بازخورد در صندوق‌های قابل معامله زعفران

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چکیده

صندوق‌های کالایی یکی از انوع صندوق‌های قابل معامله در بورس هستند که دارایی پایه آن‌ها به جای سهام، محصولات کشاورزی، انرژی و یا فلزات می‌باشند. این صندوق‌ها به روش‌های مختلفی نظیر نگه‌داری فیزیکی کالا، قرارداد آتی کالای منفرد، سبدی از قراردادهای آتی کالاها و یا خریداری سهام کالاهای مختلف، سرمایه‌گذاران خود را در مقابل بازار انواع کالاها قرار می‌دهند. طی سال‌های اخیر، این ابزار مالی با ایجاد مزیت‌های فراوان به یکی از گزینه‌های مهم سرمایه‌گذاری در بین معامله‌گران تبدیل شده است. با وجود این تحولات، شواهد کمی در ادبیات فعلی در مورد رفتار معاملاتی سرمایه‌گذاران این صندوق‌ها گزارش شده است. هدف از این مقاله، بررسی وجود معاملات بازخورد در رفتار معامله‌گران صندوق‌های کالایی زعفران در ایران می‌باشد. به این جهت از داده‌های روزانه دو صندوق زعفران موجود در بورس کالای ایران یعنی سحرخیز و نویرا، طی دوره زمانی ۱۳۹۹/۱۰/۱۴ الی ۱۴۰۱/۰۸/۳۰ و مدل معاملات بازخورد سنتانا-وادوانی (۱۹۹۲) استفاده شده است. نتایج حاصل نشان داد که نوسان بازدهی صندوق‌های زعفران نسبت به اخبار مثبت و منفی متقارن می‌باشد. با وجود بازار رسمی با هم‌پوشانی کامل برای معاملات دارایی پایه، معامله‌گران صندوق‌های زعفران توجهی به انحراف قیمت بین صندوق‌ها و خالص ارزش دارایی آن‌ها ندارند. نتایج حاصل از برآورد مدل معاملات بازخورد نشان داد که علائمی از وجود معاملات بازخورد در هیچ کدام از صندوق‌های زعفران دیده نمی‌شود و معامله‌گران این صندوق‌ها توجهی به بازدهی گذشته آن ندارند. به نظر می‌رسد بازار این صندوق‌ها از کارایی برخوردار می‌باشد که این موضوع را می‌توان با خاص بودن دارایی پایه زعفران و سرمایه‌گذاران این صندوق‌ها در ارتباط دانست.

واژه‌های کلیدی: صندوق‌های قابل معامله، صندوق‌های کالایی زعفران، معاملات بازخورد

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