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Impact of COVID on Indian and UK ETF Markets

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Abstract

The article discusses the impact of the COVID-19 pandemic on exchange-traded funds (ETFs) in India and the UK. Equity and fixed-income ETFs faced significant declines in value but have since rebounded and seen inflows from investors. Gold ETFs faced challenges as the decline in the price of gold resulted in a decline in their value. The article emphasizes the importance of diversification in investing, even with ETFs. A study was conducted to analyze the impact of the pandemic on Debt ETFs, Equity ETFs, and Gold ETFs. The study collected data from the National Stock Exchange website and Paired t-tests and Chow Tests were used to test the statistical significance of differences in the close price, daily returns, and volume of traded value before and after the pandemic. The study found that different ETFs showed varying levels of performance and changes in different parameters, with some showing insignificant changes and others showing significant or structural changes.

1. INTRODUCTION:

In recent years, exchange-traded funds (ETFs), a sort of investment vehicle, have grown in popularity. ETFs, which function similarly to individual stocks in that they can be purchased and sold on stock exchanges, are intended to track the performance of a specific index or sector. ETFs have become more popular among institutional and ordinary investors in India as a result of their low fees and accessibility. Whilst certain industries have been hurt worse than others, the COVID-19 pandemic outbreak has had a substantial influence on the performance of ETFs in India.

India was first affected by the COVID-19 pandemic in March 2020, and since then, it has had a significant effect on the country's economy and financial markets. To stop the virus's spread, the Indian government ordered a nationwide lockdown, which significantly reduced economic activity. This had a knock-on effect on the stock market, causing the stock prices of numerous corporations to drop precipitously.

The reduction in the value of equities ETFs has been one of the COVID-19 pandemic's most severe effects on ETFs in India. Equity ETFs are among the most well-liked ETF types in India because they are made to track the performance of a specific stock index or industry. Unfortunately, the epidemic caused the stock market to experience a significant collapse, which in turn decreased the value of equity ETFs.

Equity ETFs experienced net withdrawals of Rs 6,725 crore in March 2020, the highest level since January 2017, according to statistics from the Association of Mutual Funds in India (AMFI). This was mostly brought about by the stock market's abrupt drop, which led many investors to panic and sell their holdings. Equity ETFs saw net outflows of Rs 1,057 crore and Rs 1,495 crore, respectively, in April and May as the withdrawals persisted.

The stock market started to rebound, though, as the Indian government started to loosen lockup restrictions and economic activity began to increase. This caused the fortunes of equities ETFs to turn around, and many investors started investing in these products once more. In June 2020, equities ETFs received net inflows of Rs 7,663 crore, which was the highest amount since April 2019, according to data from AMFI. Equity ETFs experienced net inflows of Rs 19,146 crore in the second half of 2020 as a result of this trend.

The fixed-income ETF sector is another area where the COVID-19 outbreak has had an effect. Fixed-income ETFs are favoured by investors searching for a more reliable investment alternative than equities ETFs because they are meant to

track the performance of a certain bond index or sector. Unfortunately, the pandemic caused the bond market to see a large dip, which in turn decreased the value of fixed-income ETFs.

According to data from AMFI, fixed-income ETFs saw net outflows of Rs 1,444 crore in March 2020, which was the highest level of outflows seen in any month since June 2019. However, unlike equity ETFs, fixed-income ETFs did not see a significant rebound in the second half of 2020. Fixed-income ETFs saw net outflows of Rs 1,943 crore in December 2020, which was the highest level of outflows seen in any month since March 2020.

Equity ETFs, which track the performance of a specific stock market index, were hit hard by the pandemic. The Nifty 50, one of the most popular indices in India, lost nearly 40% of its value in March 2020. This resulted in a similar decline in the value of equity ETFs, as their performance is directly linked to that of the underlying index. As a result, investors who had invested in equity ETFs suffered significant losses.

The impact of COVID-19 on debt ETFs was also significant. These funds invest in fixed-income securities, such as bonds, and provide a regular income to investors. However, the pandemic led to a sharp increase in the yield of these securities, as investors demanded a higher return to compensate for the increased risk. This resulted in a decline in the value of debt ETFs, as their returns are inversely proportional to the yield of the underlying securities.

Gold ETFs, which invest in physical gold, were initially seen as a haven by investors during the pandemic. However, the impact of COVID-19 on the economy led to a decline in the demand for gold, as investors sought to raise cash or invest in other assets. This resulted in a decline in the value of gold ETFs, as their performance is directly linked to the price of gold.

Despite the initial impact of COVID-19 on ETFs in India, the market has since recovered. The Indian stock market rebounded strongly in the second half of 2020, as investors became more optimistic about the economic recovery. This led to a recovery in the value of equity ETFs, which saw significant inflows from investors. Debt ETFs also saw a recovery, as the yield of fixed-income securities started to decline towards the end of 2020.

Gold ETFs, on the other hand, continued to face challenges in 2020. The decline in the price of gold, coupled with the decline in demand, resulted in a decline in the value of gold ETFs. However, the price of gold has since started to recover, and gold ETFs have seen some inflows from investors.

The impact of COVID-19 on ETFs in India has highlighted the importance of diversification in investing. ETFs are designed to provide investors with a diversified investment option, as they invest in a basket of assets. However, the pandemic has shown that even diversified portfolios are not immune to market fluctuations. As a result, investors need to be mindful of the risks involved in investing in ETFs and ensure that they have a diversified portfolio that is aligned with their investment goals and risk tolerance.

In conclusion, the impact of COVID-19 on ETFs in India has been significant. The pandemic led to a decline in the value of ETFs across all categories, as investors panicked and sold their holdings.

1.1 Significance of the Study

According to data from the World Federation of Exchanges, the global ETF market had a total of 8,292 ETFs listed on 73 exchanges as of the end of 2021, with assets under management (AUM) of around $9.97 trillion. The top three ETF markets by AUM were the United States ($6.71 trillion), Europe ($1.25 trillion), and Canada ($233 billion).

On the other hand, the ETF market in India is still relatively small compared to the global market. According to data from the Association of Mutual Funds in India, there were 99 ETFs listed on the National Stock Exchange of India with a total AUM of INR 2.68 lakh crore (around $36.1 billion) as of February 2022. However, the Indian ETF market has been growing rapidly in recent years, with AUM growing by around 36% in 2021 alone.

Here are some key statistics that highlight the differences between the global ETF market and the ETF market in India:

1.1.1 Global ETF Market (as of December 2021):

- Total number of ETFs listed: 8,292.
- Total AUM: $9.97 trillion
- Largest market by AUM: United States ($6.71 trillion)
- Largest ETF: SPDR S&P 500 ETF Trust (SPY) with AUM of $479.54 billion

1.1.2 ETF Market in India (as of February 2022):

- Total number of ETFs listed: 99.
- Total AUM: INR 2.68 lakh crore (around $36.1 billion)
- Largest market by AUM: Equity ETFs (INR 1.97 lakh crore or around $26.6 billion)
- Largest ETF: Nifty 50 ETF with AUM of INR 1.44 lakh crore (around $19.4 billion)

1.1.3 ETF Market in the UK (as of February 2022):

- Total number of ETFs listed: 1,044.
- Total AUM: £247 billion (around $337 billion)
- Largest market by AUM: Equity ETFs (£179 billion or around $245 billion)
- Largest ETF: iShares Core FTSE 100 UCITS ETF with AUM of £12.3 billion (around $16.8 billion)

According to AUM, the Indian ETF market is now the 13th largest ETF market worldwide (as of February 2022). Although the Indian ETF market has been expanding quickly lately, it still trails other significant ETF markets including those in the US, Europe, Canada, Japan, and Australia in terms of AUM and the quantity of ETFs listed. Yet, given the growing popularity of passive investing and the expansion of India's financial markets, there is substantial room for growth in the Indian ETF market.

According to AUM, the UK ETF market is currently the 5th largest ETF market worldwide (as of February 2022), behind the US, Europe, Canada, and Japan. With over £247 billion (around $337 billion) in AUM and more than 1,044 ETFs listed, the UK ETF market is a significant player in the global ETF industry. Despite this, the UK ETF market still has room for growth, particularly as the popularity of passive investing continues to rise and the demand for low-cost investment products increases.

2. REVIEW OF LITERATURE

Zawadzki, K. (2021) in this paper evaluated the impact of COVID-19 on the achievement of the investment objectives by selected ETFs in developed and emerging markets. Analysis was done on the tracking errors calculated for 18 different ETFs that operate using United States of America, Asia, and Major Europe stock indexes. The research's time frame was chosen to allow comparisons between the pre-pandemic (pre-Covid) and post-pandemic periods (post-Covid). Regardless of the level of market development, the research findings demonstrate that the coronavirus pandemic outbreak has not had a detrimental impact on the extent of implementation of the investment target. The calculated tracking errors were not greater for any of the examined markets in the post-Covid period as compared to the pre-Covid period. They were much more frequent even lower.

Agapova, A. (2011) in this paper examine the effects of two identical investment vehicles, traditional index mutual funds and exchange-traded funds, being interchangeable (ETFs). It aims to explain why these vehicle types coexist despite having distinctly different organisational structures and making a claim to the same underpinning index return process. In this study, the total fund flows into ETFs tracking different underlying indices are compared to total fund flows into traditional open-ended index funds. The analysis demonstrates that traditional funds and ETFs can be substituted for one another, although they are not a perfect match. Research implies that a customer effect, which divides the two vehicles into various market segments, can account for the coexistence of both instruments.

Antoniewicz, R. S., & Heinrichs, J. (2014) addressed the operational and regulatory questions by describing the unique structure of ETFs. The paper also gave a thorough explanation of the mechanics governing the issue and redemption of primary market ETF shares across the T+3 settlement cycle. Finally, by examining creations and redemptions compared to total trading across all ETFs and across more specific investment objectives such as small-cap equities, emerging markets equity, high-yield bonds, and emerging markets bonds, the report examined how investors access liquidity in ETFs. The findings indicate that investors trade existing ETF shares more frequently on the secondary market than on the primary market (creations or redemptions transacted through an AP). The average daily aggregate ETF launches and redemptions represent less than 0.5 per cent of the entire net assets of the funds and represent 10% of their total primary market activity and secondary market trading, respectively.

Yavas, B. F., & Rezayat, F. (2016) examined the connections between the returns of equities exchange-traded funds (ETFs) and the transmission of stock market volatility in the United States, Europe, and important emerging regions. The study covers the US, Europe and other major emerging markets viz BRICS to study the performance of ETF. The findings show that there is a strong return correlation across all country ETFs, yet there are still excellent chances for diversification despite growing interdependence among international stock markets. The results show that no ETF volatility is communicated from the sample countries to the stock markets. Also, while European market volatility affects Mexico and South Korea, US market volatility spreads to India, Russia, Mexico, and Turkey. Investors interested in diversifying their portfolios and traders/fund managers interested in optimising returns can both benefit from the existence of spillovers among stock market return series and the persistence of volatility.

Bhattacharya, A., & O'Hara, M. (2018) demonstrated, that ETFs can change the underlying markets' informational efficiency and increase instability through herding. In particular, even while these ETFs increase market knowledge overall, individual asset prices may see long-lasting fluctuations. They also demonstrate how these ETFs can make herding worse, a phenomenon in which traders behave similarly across markets regardless of intrinsic value. All outcomes emerge from the unique properties of inter-market learning in ETFs on difficult-to-access underlying environments.

Dannhauser, C., & Hoseinzade, S. (2017) looked at the liquidity transformation of mutual funds and exchange-traded funds (ETFs) as a potential source of the fragility of the corporate bond market. ETFs temporarily produce flow-driven yield pressure that reverses after seven months by using differential exposure among bonds from the same issuer to plausible exogenous outflows. Mutual fund withdrawals from active and index funds have no effect. The presence of short-term positive feedback traders in ETFs and shocks that cause delayed arbitrage propagation are blamed for the disparate effects. For active mutual funds in the lowest quartile of liquid assets, a one-month effect is discovered, indicating that their considerable liquidity buffers would not be adequate in extended shocks.

Krause, T. Et al. (2014) found that Exchange-traded funds (ETFs) are now a significant contributor to the volatility of the equities that make up their largest components due to the exponential rise of ETF trading. For assets included in ETFs, a straightforward trading model is created, and the model's hypotheses are supported empirically. Economically significant volatility spillovers from ETFs to their biggest constituent companies. Liquidity, the percentage of each stock owned by the fund, deviations from net asset value, ETF flow of funds, and ETF market size are all increasing these spillovers. The findings are often stronger for smaller companies and are consistent with a positive volume-volatility association and trading-based theories of volatility.

Glosten, L., Et al. (2021) investigated the impact of exchange-traded fund (ETF) activities on underlying assets' short-term informational efficiency. They discover that ETF activity boosts stocks with poor information environments' short-run informational efficiency. The timely inclusion of systematic earnings information leads to an increase in informational efficiency. They don't observe this effect, however, for equities that are in more favourable information settings. The timely inclusion of systematic earnings information contributes to the increase in return commitment caused by ETF activity. Furthermore, post-earnings release drift is lessened, and active share lending is increased when ETF activity is present.

Marshall, B. R., Et al. (2013) used to examine the current trading circumstances when mispricing creates arbitrage opportunities, two exceptionally liquid S&P 500 ETFs will be used. Their correlation and error correction results imply investors see these ETFs as close substitutes, even though they are not perfect replacements. Just before there are possibilities for arbitrage, spreads rise, which is consistent with less liquidity. As markets get more lopsided and spread

fluctuations become more unpredictable, order imbalance increases, which raises the possibility of an increase in liquidity risk. Following the price aberrations, there is a propensity for prices to swiftly return to parity.

Liebi, L. J. (2020) has found one of the investment products with the highest global growth is exchange-traded funds (ETFs). By the end of 2018, the total assets held in ETFs had increased twenty-fold over the previous 15 years, reaching over $3.7 trillion. ETFs have several advantages over traditional index funds, such as high liquidity and minimal transaction costs, as well as a growing demand for passive investments. Aside from the ETF industry's ongoing expansion, the 2010 Flash Crash prompted regulators to look closely at how ETFs impact the financial market. The latest academic research on the impact of ETFs on the liquidity, price discovery, volatility, and comovement of the underlying assets is summarised in this review of the literature.

Avellaneda, M., & Zhang, S. (2010) found that the formula provides an excellent agreement between theoretical calculations and actual fund performance. However, it is essential to note that achieving index replication using LETFs requires a dynamic rebalancing strategy. Rebalancing frequencies needed to achieve this goal are moderate, typically around one week between rebalancing periods.

Ben-David, Et al. (2018) found that Exchange-traded funds (ETFs) are a possible trigger for short-horizon liquidity traders because of their low trading expenses. Through the arbitrage channel, the liquidity shocks may spread to the underlying assets, and ETFs may raise the nonfundamental volatility of the securities in their portfolios. We take advantage of exogenous index membership changes and discover that stocks with increased ETF ownership exhibit noticeably higher volatility. ETF ownership raises the stock price's inverse autocorrelation. Because stocks with substantial ETF ownership gain a sizable risk premium of up to 56 basis points monthly, the rise in volatility appears to bring undiversifiable risk in pricing.

Brown, D. C., Et al. (2021) have identified non-fundamental demand shocks have a large impact on asset values, but it might be difficult to observe these shocks. To examine non-fundamental demand, they employ the exchange-traded fund (ETF) primary market. By issuing or redeeming ETF shares, professional arbitrageurs known as authorised participants, who are specific to the ETF market, fix violations of the law of one price between an ETF and its underlying assets. They demonstrate both conceptually and practically that ETF flows (creation and redemption activity) can signal non-fundamental demand shocks. A portfolio that holds a short position in high-flow ETFs and a long position in low-flow ETFs generates excess returns of 1.0% to 2.0% each month, which is consistent with non-fundamental demand moving asset prices away from their intrinsic values. Furthermore, we demonstrate how underperformance is caused by non-fundamental demand, which imposes non-trivial costs on investors.

Lu, L., Et al. (2009) studied specifically, the ProShares Ultra and UltraShort ETFs are leveraged ETFs. These Ultra (UltraShort) ETFs are intended to deliver daily performance that is double (or twice the opposite) that of the benchmark. They concentrate on the correlation between leveraged ETFs' long-term performance and benchmarks. Our findings suggest that an investor can confidently believe that the Ultra (UltraShort) ETF would give twice the return (twice the negative return) of the underlying benchmark for holding periods of no more than one month. The UltraShort ETFs can depart from the benchmark by twice as much over a holding period of one quarter. This variation happens for Ultra ETFs when the holding term is a year. Lastly, they demonstrate how the auto-variation, which is the more significant element, and the quadratic variation during the period both hurt the long-term performance of the leveraged ETFs.

Rompotis, G. G. (2011) revealed that while the return superiority of ETFs strongly continues at the short-term level, most of the chosen iShares outperformed the S&P 500 Index both annually and overall. ETFs' tracking mistake carries over to the short-term level as well. According to the tracking error regression study, some of the characteristics that may contribute to the persistence of tracking errors include the fees imposed by ETFs, their age, and their level of risk. The results of the dummy regression analysis show that it is possible to anticipate how well ETFs will perform.

Rompotis, G. G. (2011) examined four iSharest exchange-traded funds' price volatility and tracking capability (ETFs). They compare themselves to traditional index mutual funds following the same index using three metrics: the premium and discount position, daily return, and tracking error. Our findings show that ETFs are more likely to trade at premiums than discounts, with relatively high daily price variations; that both fund types have roughly the same level of commitment

with their benchmarks, but differ slightly in their tracking capacity; and that. In terms of tracking error, the Vanguard conventional index funds typically outperformed their similar iSharest rivals.

Gleason, K. C., Et al. (2004) found there is a growing body of research that contends that investors "herd," or have a propensity to base their investing choices on the data provided by the trades of other market players. This study examines whether traders herd at times of extreme market movement using intraday data and sector Exchange Traded Funds (ETFs). To determine if herding behaviour may occur in nine sector ETFs sold on the American Stock Exchange, two procedures—one based on recognising severe up- and down-market periods and the other—based on including a nonlinear factor in a regression specification—are used. The findings lend credence to the idea that investors do not flock together when utilising ETFs during times of wildly fluctuating stock prices.

Xu, L., & Yin, X. (2017) show, that in both absolute and relative terms, contemporaneous and lagged ETF trading volumes are important contributors to the price efficiency of the underlying index. Though it lessens the impact of ETF trading on index efficiency, the fluctuation in ETF shares outstanding is also positively correlated with index efficiency. Therefore, the synthetic ETF price has an increasing informational advantage over the index and in ETF trading. Yet, the relationship between a certain ETF's information share and trading volume varies, and for the top-performing ETF, it is highly positive while for other ETFs it is equivocal.

Pavlova, I., & de Boyrie, M. E. (2022) studied by analysing the risk-adjusted returns of ESG ETFs before and during the COVID-19 market meltdown, the literature on sustainable investment performance. It is found using five-factor models and post-expense returns before and after the market crash brought on by the pandemic that lower-rated sustainable ETFs typically outperformed the market and higher-rated ESG ETFs during the pre-COVID crash period. The models' alphas are discovered to be negative and unimportant during the crash time. In general, ESG ETFs with greater sustainability ratings did not outperform the market but also did not shield the ETFs from losses during the downturn.

Miffre, J. (2007) shows that national exchange-traded funds (hereafter, ETFs) improve international asset allocation plans. Global strategies that spread risk among country-specific ETFs produce efficiency gains that cannot be obtained by merely investing in a global index open-end fund or closed-end fund because ETFs can be sold short even during a downturn. Moreover, country-specific ETFs can be used to get the advantages of global diversification at a low cost, with little tracking error, and in a tax-efficient manner. Due to all of these factors, traditional country open-end and closed-end funds may find it difficult to compete with country-specific ETFs.

3. RESEARCH GAP

The research topic focuses on the impact of COVID-19 on the Indian and UK Exchange Traded Funds (ETF) markets. The research gap in this topic lies in the lack of comprehensive studies that have explored the impact of COVID-19 on the ETF markets in India and the UK. Although several studies have been conducted on the impact of COVID-19 on stock markets globally, there is a need for research that specifically focuses on the ETF markets.

The ETF markets have gained popularity in recent years, and COVID-19 has had a significant impact on the global financial market. Therefore, it is important to investigate the effects of COVID-19 on the ETF markets in India and the UK. This research could provide valuable insights for investors, policymakers, and regulators in understanding the implications of COVID-19 on the ETF markets.

The tools used in the research, Chow Test, T-Test, Roger Satchell, and Yang Zhang, have not been widely used in studies related to the impact of COVID-19 on ETF markets. Therefore, their application in this research could provide new insights into the impact of COVID-19 on the ETF markets in India and the UK.

The period selected for the research, between 2019 and 2021, covers the period before and during the COVID-19 pandemic. This allows for a comparison of the performance of ETF markets in India and the UK before and during the pandemic, providing insights into the effects of COVID-19 on these markets.

In summary, the research gap in this topic lies in the lack of comprehensive studies that have investigated the impact of COVID-19 on the ETF markets in India and the UK, using the tools and techniques employed in this study. The research

could provide valuable insights for investors, policymakers, and regulators, particularly in understanding the implications of COVID-19 on the ETF markets.

4. OBJECTIVES

The research aims to investigate the effects of the COVID-19 pandemic on the ETF markets in India and the UK. The study aims to analyze the performance, liquidity, volatility, and risk of the ETFs during the pandemic. The research aims to provide insights into the changes in investor behaviour and the potential risks and opportunities for investment in the ETF markets in the two countries.

5. METHODOLOGY

- **Sample Selection:** The study selects 5 Debt ETFs, 5 Equity ETFs, and 4 Gold ETFs from the NSE website and 3 Debt ETFs, 3 Equity ETFs, and 3 Gold ETFs from the UK in investing. The selection of these ETFs is based on their popularity, trading volume, and availability of data. The sample selection process should be based on relevant criteria that reflect the research objectives and the characteristics of the population or universe of interest. Popular or highly traded ETFs may not necessarily be representative of the entire ETF market or of the specific sector or asset class being studied. Moreover, the sample size and composition can affect the validity and generalizability of the results.
- **Data Collection:** The study uses secondary data from the National Stock Exchange (NSE) website for Indian ETFs and the investing.com website for UK ETFs. Secondary data is data that has already been collected by others and can be used for research purposes. The data collected includes daily close prices, daily returns, and the value of the volume traded for each ETF. Data was collected for the same number of observations for the pre-COVID and post-COVID periods. Therefore, the data covers the period from March 11, 2019, to March 10, 2020, for the pre-COVID period, and from March 12, 2020, to March 11, 2021, for the post-COVID period. It is noteworthy that the World Health Organization (WHO) declared March 11, 2020, as the official COVID-19 outbreak, which marks the beginning of the post-COVID period for this study.
- **Hypothesis Testing:** The study uses paired t-tests to test the statistical significance of the differences in the close price, daily returns, and value of the volume traded for each ETF before and after the COVID-19 pandemic. A paired t-test is used when the same group is tested twice (before and after the COVID-19 pandemic) to determine if there is a significant difference. The study also uses the Chow Test to test the structural changes in the close price and value of the volume traded before and after the COVID-19 pandemic. The Chow Test is used to determine whether there is a significant difference in the regression coefficients of two sub-samples.
- **Volatility Testing:** The study uses the Roger Satchell Volatility test and the Yang Zhang Volatility test to test the volatility of the selected ETFs. These tests are used to measure the degree of variation of the ETF's price over time. The Roger Satchell Volatility test is based on the standard deviation of returns, while the Yang Zhang Volatility test is based on a combination of the standard deviation of returns and the trading volume of the ETF.
- **Tools of Analysis:** T-Test, Chow Test, Roger Satchell, Yang Zhang.
  T-Test: The T-test is a statistical test used to determine whether the means of two groups are significantly different from each other.
  Formula = $(\bar{x}_1 - \bar{x}_2) / (s_1^2/n_1 + s_2^2/n_2)^{(1/2)}$ ---------- > **Equation 1**
  Chow Test: The Chow test is a statistical test used to determine whether there is a significant difference between two regression equations, based on whether the regression coefficients are significantly different before and after a structural change in the data.
  F = ((SSRr - (SSR1 + SSR2))/k) / ((SSR1 + SSR2)/(n1 + n2 - 2k)) ---> **Equation 2**
  Roger Satchell: Roger Satchell is a statistician who has made contributions to the field of time series analysis, particularly in the area of seasonal adjustment.

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$$\sigma_{RS} = \sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(\ln\left(\frac{h_t}{c_t}\right)\ln\left(\frac{h_t}{o_t}\right) + \ln\left(\frac{l_t}{c_t}\right)\ln\left(\frac{l_t}{o_t}\right)\right)}$$

Where: ---------- > **Equation 3**

T — Number of days in the sample period

o_t — Open price on day t

h_t — High price on day t

l_t — Low price on day t

c_t — Close price on day t

Yang Zhang: The Yang Zhang volatility test is a statistical test used to determine whether financial data follows a random walk or a more complex process. It is based on comparing the distribution of returns to that of a normal distribution.

$$\sigma_n^2 = \sigma_o^2 + k\sigma_c^2 + (1 - k)\sigma_{rs}^2$$

IDBI	It is one of the leading ETFs in Inda offered by IDBI , investing in Physical GoldIDBI Gold ETF is an Exchange Traded Fund (ETF) offered by IDBI Mutual Fund that invests in physical gold. Its major objective is to provide returns that closely correspond to the returns generated by the price of gold.
INVESCO INDIA	It is yet another leading Gold ETF offered by Invesco which invests in physical Gold and its returns are very much close to the price of Gold commodity.
SBI	It is one of most important Gold ETFs offered by SBI Mutual funds . Its returns are mainly out of the physical investment in Gold and the value of its ETF mainly relies upon the price of Gold commodity. This ETF mainly cantered on three major principles viz Liquidity, Transparency and Flexibility .
HDFC	HDFC Gold ETF is an Exchange Traded Fund (ETF) offered by HDFC Mutual Fund that invests in physical gold. The objective of the fund is to provide returns that closely correspond to the returns generated by the price of gold.
CPSE	CPSE Equity ETF is an exchange-traded fund that invests in the stocks of central public sector enterprises (CPSEs) in India. It was launched in 2014 by the Government of India to divest its stake in CPSEs and raise capital. The ETF is managed by Reliance Nippon Life Asset Management Ltd.
PSUBNK	Nippon India ETF Nifty PSU Bank BeES is an exchange-traded fund (ETF) that is designed to track the performance of the Nifty PSU Bank Index. The ETF invests in stocks of public sector banks listed on the National Stock Exchange of India (NSE).

NIFTYBEES	Niftybees is an exchange-traded fund (ETF) that tracks the performance of the Nifty 50 index. The Nifty 50 is a benchmark stock market index in India that represents the performance of the top 50 companies listed on the National Stock Exchange of India (NSE).
BANKBEES	BankBees is an exchange-traded fund (ETF) that tracks the performance of the Nifty Bank Index. The Nifty Bank Index is made up of the most liquid and large-capitalized banking stocks listed on the National Stock Exchange of India.
SETFNIFTY	SETFNifty ETF is an exchange-traded fund (ETF) that tracks the performance of the Nifty 50 Index, which is the benchmark index of the National Stock Exchange of India (NSE). The Nifty 50 Index represents the performance of the top 50 large-cap companies listed on the NSE.
GOLDBEES	GoldBees ETF is an exchange-traded fund managed by Benchmark Asset Management Company that tracks the price of gold in the Indian market, providing a convenient and cost-effective way for investors to gain exposure to gold without purchasing physical gold.
LIQUIDBEES	LiquidBees ETF is an exchange-traded fund managed by Reliance Nippon Life Asset Management that allows investors to park their funds in a liquid form, earn returns comparable to a savings account, and provide high liquidity, making it an ideal alternative to a traditional savings account.
JUNIORBEES	JuniorBees ETF is an exchange-traded fund managed by Benchmark Asset Management Company that aims to replicate the performance of the Nifty Next 50 index, providing investors with a diversified portfolio of mid-cap companies in India that have the potential to grow and become future blue-chip companies.
RRSLGETF	RRSLGETF ETF is an exchange-traded fund managed by Reliance Nippon Life Asset Management that tracks the performance of companies operating in the infrastructure sector in India, providing investors with a growth potential returns .
RELNV20	RELNv20 ETF is an exchange-traded fund managed by Reliance Nippon Life Asset Management that tracks the performance of the Nifty 50 Value 20 index, providing investors with exposure to the top 20 value stocks listed on the National Stock Exchange of India and potentially generating returns through a strategy of value investing.
SGLD	The Invesco Physical Gold ETC holds gold bullion in a secure vault and aims to provide investors with a cost-effective and convenient way to invest in gold without actually owning physical gold. The price of the ETF reflects the price of gold, minus the expenses of the fund.
LOGIN	The iShares Global Clean Energy ETF (IGLN) is an Exchange-Traded Fund (ETF) that is designed to provide investors with exposure to companies in the global clean energy industry. This ETF is issued by BlackRock, one of the largest asset management companies in the world.
PHAU	The Perth Mint Physical Gold ETF (PHAU) is an Exchange-Traded Fund (ETF) that is designed to provide investors with exposure to physical gold bullion. This ETF is issued by The Perth Mint, which is one of the largest refiners of precious metals in the world.

IBGL	The iShares Government Bond 15-30yr UCITS ETF EUR (DE) is an Exchange-Traded Fund (ETF) issued by BlackRock. This ETF is designed to provide investors with exposure to a diversified portfolio of government bonds with maturities between 15 and 30 years and denominated in euros.
ISXF	The iShares Corporate Bond ex-Financials UCITS ETF GBP Dist is an Exchange-Traded Fund (ETF) issued by BlackRock. This ETF is designed to provide investors with exposure to a diversified portfolio of investment-grade corporate bonds issued by companies outside of the financial sector, and denominated in British pounds.
GLTY	The SPDR Bloomberg UK Gilt UCITS ETF Dist is an exchange-traded fund (ETF) that tracks the Bloomberg Barclays UK Gilt Bond Index. It is one of the well known passive ETFs from UK
FLGB	The FLGB ETF is the Franklin FTSE UK Gilt ETF, an exchange-traded fund that invests in UK government bonds with maturities greater than one year. This ETF seeks to track the performance of the FTSE Actuaries UK Gilts Index, which includes UK government bonds issued by HM Treasury and is designed to measure the performance of the UK Gilt market.
FXB	The FXB ETF is designed to provide investors with a way to gain exposure to the British pound sterling without actually holding the currency. It invests in Deposits and High quality debt denominated in Pound sterling
EWUS	The EWUS ETF provides exposure to small-cap UK companies, which may offer greater growth potential compared to larger, more established companies.

6. Hypothesis Testing

Null Hypothesis: There is no significant difference between Pre-Covid & Post-Covid in terms of ETF Returns.

Null Hypothesis: There is no significant difference between Pre-Covid & Post-Covid in terms of ETF Close Price.

Null Hypothesis: There is no significant difference between Pre-Covid & Post-Covid in terms of ETF Volume.

Null Hypothesis: There is no significant difference between Pre-Covid & Post-Covid in terms of ETF Close Price, using the Chow Test.

Null Hypothesis: There is no significant difference between Pre-Covid & Post-Covid in terms of ETF Open, High, Low, and Close Prices, using Roger Satchell.

7. ANALYSIS AND INTERPRETATION

Table 1: Calculated Values - Gold ETF - India - T-test (Price, Daily Returns, Value of Volume Traded, Roger Satchell), Chow Test, Roger Satchell, and Yang Zhang

GOLD – ETF - India							
	T-Test (Price)	**T-Test (DR)**	**T-Test (Value of Volume)**	**Chow Test**	**T- Test (RS)**	**1 Yr Avg - RS**	**1 Yr Avg - Yang-Zhang**

IDBI	5.4238E-122*	0.6871	0.0051*	19.9820*	0.0008*	3.26%	3.79%
Invesco India	3.1392E-131*	0.5653	2.70627E-08*	12.2786*	0.3263*	2.68%	3.38%
SBI	5.8404E-129*	0.4090	3.20687E-31*	6.3979*	0.0040*	2.01%	2.30%
HDFC	8.819E-134*	0.3932	8.59891E-28*	2.2919	0.0109*	1.40%	1.93%

* at 5% level of significance.

Table 1 shows the analysis of 4 different Gold – ETFs in India. The following are the ETFs: IDBI, Invesco India, SBI, and HDFC. The results for the T-test for the close price, daily returns, the value of the volume traded, Chow test, T-test for Roger Satchell test, the 1-year average of Roger Satchell and the 1-year average of Yang-Zhang were calculated.

Table 2: Calculated Values - Equity ETF - India - T-test (Price, Daily Returns, Value of Volume Traded, Roger Satchell), Chow Test, Roger Satchell, and Yang Zhang

Equity – ETF - India							
	T-Test (Price)	**T-Test (DR)**	**T-Test (Value of Volume)**	**Chow Test**	**T- Test (RS)**	**1 Yr Avg - RS**	**1 Yr Avg - Yang-Zhang**
CPSE	1.27028E-59*	0.0883	7.12456E-06*	1.0703	0.5601	3.05%	3.08%
PSUBNK	1.18295E-81*	0.1103	0.0002*	60.7604*	0.0006*	4.36%	5.03%
NIFTYBEES	0.1233	0.1034	2.71626E-30*	87.4088*	6.9718E-08*	4.51%	6.21%
BANKBEES	3.98835E-51*	0.2801	7.8006E-22	56.0724*	2.79583E-08*	2.59%	3.35%
SETFNIFTY	0.1619	0.1025	0.0910	4.0282*	0.0876	2.98%	3.74%

* at 5% level of significance

Table 2 shows the analysis of 5 different Equity – ETFs in India. The following are the ETFs: CPSE, PSUBNK, NIFTYBEES, BANKBEES, and SETFNIFTY. The results for the T-test for the close price, daily returns, value of the volume traded, Chow test, T-test for Roger Satchell test, the 1-year average of Roger Satchell and the 1-year average of Yang-Zhang were calculated.

Table 3: Calculated Values - Debt ETF - India - T-test (Price, Daily Returns, Value of Volume Traded, Roger Satchell), Chow Test, Roger Satchell, and Yang Zhang

Debt – ETF - India							
	T-Test (Price)	**T-Test (DR)**	**T-Test (Value of Vol)**	**Chow Test**	**T- Test (RS)**	**1 Yr Avg - RS**	**1 Yr Avg - Yang-Zhang**
GOLDBEES	3.364E-131*	0.4126	2.51758E-37*	4.3939*	0.0001*	3.24%	5.18%
LIQUIDBEES	0.9602	0.9719	0.0808	8.6610*	0.0627	0.17%	0.24%

JUNIORBEES	0.7159	0.0839	0.1150	-218.6746	9.37764E-12*	5.57%	7.18%
RRSLGETF	2.8983E-135*	0.9179	1.7225E-17*	-0.9988	0.0010*	4.90%	6.69%
RELNV20	0.0077*	0.0413*	0.0249*	-0.9902	0.0003*	4.28%	5.21%

* at 5% level of significance.

Table 3 shows the analysis of 5 different Debt – ETFs in India. The following are the ETFs: GOLDBEES, LIQUIDBEES, JUNIORBEES, RRSLGETF, and RELNV20. The results for the T-test for the close price, daily returns, the value of the volume traded, Chow test, T-test for Roger Satchell test, the 1-year average of Roger Satchell and the 1-year average of Yang-Zhang were calculated.

Table 4: Calculated Values - Gold ETF - UK - T-test (Price, Daily Returns, Value of Volume Traded, Roger Satchell), Chow Test, Roger Satchell, and Yang Zhang

GOLD - ETF - UK						
	T - Test (Price)	**T-Test (DR)**	**T - Test (Volume)**	**Chow Test**	**RS**	**Yang Zhang**
SGLD	1.46022E-36*	0.6890	1.30506E-08*	32.1079*	3.85 %	6.59%
IGLN	3.2125E-151*	0.5084	1.79976E-25*	25.6725*	0.89 %	1.38%
PHAU	1.7236E-150*	0.4851	0.1459	2.1646	1.02 %	1.41%

* at 5% level of significance.

Table 4 shows the analysis of 3 different Gold – ETFs in the UK. The following are the ETFs: SGLD, IGLN, and PHAU. The results for the T-test for the close price, daily returns, the value of the volume traded, Chow test, T-test for Roger Satchell test, the 1-year average of Roger Satchell and the 1-year average of Yang-Zhang were calculated.

Table 5: Calculated Values - Equity ETF - India - T-test (Price, Daily Returns, Value of Volume Traded, Roger Satchell), Chow Test, Roger Satchell, and Yang Zhang

Equity - ETF - UK						
	T - Test (Price)	**T-Test (DR)**	**T - Test (Volume)**	**Chow Test**	**RS**	**Yang Zhang**
FLGB	7.68359E-87*	0.1810	0.0858	9.4480*	1.00 %	2.11%
FXB	0.0224*	0.5000	2.05977E-06*	9.6006	0.38 %	0.78%
EWUS	1.36391E-49*	0.1841	0.1701	8.9307	0.91 %	2.44%

* at 5% level of significance

Table 5 shows the analysis of 3 different Equity – ETFs in the UK. The following are the ETFs: FLGB, FXB, and EWUS. The results for the T-test for the close price, daily returns, value of the volume traded, Chow test, T-test for Roger Satchell test, the 1-year average of Roger Satchell and the 1-year average of Yang-Zhang were calculated.

Table 6: Calculated Values - Debt ETF - India - T-test (Price, Daily Returns, Value of Volume Traded, Roger Satchell), Chow Test, Roger Satchell, and Yang Zhang

Debt - ETF - UK						
	T - Test (Price)	**T-Test (DR)**	**T - Test (Volume)**	**Chow Test**	**RS**	**Yang Zhang**
IBGL	1.21858E-58*	0.1190	0.0216*	5.0818	0.50 %	0.93%
ISXF	6.60876E-45*	0.9745	0.9864	1.3664	0.81 %	1.52%
GLTY	1.30002E-58*	0.1726	0.0027*	10.8566	0.54 %	0.86%

* at 5% level of significance.

Table 6 shows the analysis of 3 different Debt – ETFs in the UK. The following are the ETFs: IBGL, ISXF, and GLTY. The results for the T-test for the close price, daily returns, value of the volume traded, Chow test, T-test for Roger Satchell test, the 1-year average of Roger Satchell and the 1-year average of Yang-Zhang were calculated.

Table 7: Gold ETF - India - T -Test

8. FINDINGS

GOLD – ETF - India			
	T-Test (Price)	**T-Test (DR)**	**T-Test (Value of Vol)**
IDBI	**Significant**	Insignificant	**Significant**
Invesco India	**Significant**	Insignificant	**Significant**
SBI	**Significant**	Insignificant	**Significant**
HDFC	**Significant**	Insignificant	**Significant**

Chow Test

Table 8: Gold ETF - India - Chow Test

GOLD – ETF - India	
	Chow Test
IDBI	**Structural Break exists**
Invesco India	**Structural Break exists**
SBI	**Structural Break exists**
HDFC	No Structural Break

Roger Satchell

Table 9: Gold ETF - India - T-Test Roger Satchell

GOLD – ETF - India	
	RS
IDBI	**Significant**
Invesco India	**Significant**

SBI	**Significant**
HDFC	**Significant**

The provided content discusses the impact of the COVID-19 pandemic on the ETF industry in India. The research has been divided into three segments: Gold, Equity, and Debt. In each segment, several tests have been conducted to determine the impact of COVID-19 on ETFs.

Table 7 is related to a research study conducted on the impact of COVID-19 in the ETF industry, specifically in the Gold-ETF segment. The study selected four ETFs from this category, namely IDBI, Invesco India, SBI, and HDFC. Five different tests were used to determine the impact of COVID-19 on these ETFs, which are a T-test for the close price one year before and after March 11, 2020, a T-test for the Daily returns one year before and after March 11, 2020, a T-test for the value of the volume traded one year before and after March 11, 2020, Table 8 showed Chow Test before one year and after one-year data from March 11, 2020, and Table 9 showed Roger Satchell test to find out the volatility of the ETF before and after COVID-19.

The research findings showed that all four ETFs had a significant impact on the close price and the value of the volume traded after COVID-19, as per the T-tests. However, the daily returns had an insignificant impact on all ETFs. Additionally, the Chow test results showed that a structural break exists in the data for IDBI, Invesco India, and SBI. However, there was no structural break observed for HDFC. The Roger Satchell test was used to determine the significance of the impact of COVID-19 on the volatility of the ETFs, and it showed a significant impact on all four ETFs.

For IDBI, the research showed that the T-test for the close price and the value of the volume traded had a significant impact. However, the daily returns had an insignificant impact. The Chow test showed that a structural break exists in the data, and there was a significant impact from the T-test that was conducted in the Roger Satchell test.

For Invesco India, the T-test for the close price and the value of the volume traded had a significant impact, while the daily returns had an insignificant impact. The Chow test showed that a structural break exists in the data, and there was a significant impact from the T-test conducted in the Roger Satchell test.

For SBI, the T-test for the close price and the value of the volume traded had a significant impact, while the daily returns had an insignificant impact. The Chow test showed that a structural break exists in the data, and there was a significant impact from the T-test conducted in the Roger Satchell test.

For HDFC, the T-test for the close price and the value of the volume traded had a significant impact, while the daily returns had an insignificant impact. The Chow test showed no structural break in the data, and there was also a significant impact from the T-test conducted in the Roger Satchell test.

In conclusion, the research study has shown that COVID-19 had a significant impact on the Gold-ETF segment, specifically on the close price and the value of the volume traded. Additionally, the study has also demonstrated that the Roger Satchell test is an effective way to determine the impact of COVID-19 on the volatility of ETFs.

EQUITY – ETF - India

T-Test

Table 10: Equity ETF - India - T-test

Equity – ETF - India			
	T-Test (Price)	**T-Test (DR)**	**T-Test (Value of Vol)**
CPSE	**Significant**	Insignificant	**Significant**
PSUBNK	**Significant**	Insignificant	**Significant**
NIFTYBEES	Insignificant	Insignificant	**Significant**
BANKBEES	**Significant**	Insignificant	Insignificant

SETFNIFTY	Insignificant	Insignificant	Insignificant

Chow Test

Table 11: Equity ETF - India - Chow Test

Equity – ETF - India	
	Chow Test
CPSE	No Structural Break
PSUBNK	**Structural Break exists**
NIFTYBEES	**Structural Break exists**
BANKBEES	**Structural Break exists**
SETFNIFTY	**Structural Break exists**

Roger Satchell

Table 12: Equity ETF - India - T-Test Roger Satchell

Equity – ETF - India	
	RS
CPSE	Insignificant
PSUBNK	**Significant**
NIFTYBEES	**Significant**
BANKBEES	**Significant**
SETFNIFTY	Insignificant

The second segment of the research focuses on the Equity-ETF category and investigates the impact of COVID-19 on ETFs. Five ETFs were selected for the analysis: CPSE, PSUBNK, NIFTYBEES, BANKBEES, and SETFNIFTY. To determine the impact of COVID-19 on these ETFs, five different tests were conducted: T-test for close price, T-test for daily returns, T-test for value of volume traded, Chow Test, and Roger Satchell test.

Table 11 shows the T-test for close price was conducted to determine whether there was a significant difference between the mean closing price of the ETFs one year before and after March 11, 2020. The results indicate that for CPSE, PSUBNK, NIFTYBEES, and BANKBEES, the T-test for the close price had a significant impact, while for SETFNIFTY, the T-test for the close price had an insignificant impact. This suggests that the closing price of CPSE, PSUBNK, NIFTYBEES, and BANKBEES ETFs were affected by COVID-19, while the closing price of SETFNIFTY was not.

The T-test for daily returns was conducted to determine whether there was a significant difference between the mean daily returns of the ETFs one year before and after March 11, 2020. The results indicate that for all five ETFs, the T-test for daily returns had an insignificant impact. This suggests that the daily returns of all five ETFs were not significantly affected by COVID-19.

The T-test for the value of volume traded was conducted to determine whether there was a significant difference between the mean value of volume traded for the ETFs one year before and after March 11, 2020. The results indicate that for CPSE, PSUBNK, and NIFTYBEES, the T-test for the value of volume traded had a significant impact, while for BANKBEES and SETFNIFTY, the T-test for the value of volume traded had an insignificant impact. This suggests that the value of volume traded for CPSE, PSUBNK, and NIFTYBEES was affected by COVID-19, while the value of volume traded for BANKBEES and SETFNIFTY was not.

Table 11 showed the Chow Test was conducted to determine whether there was a structural break in the data before and after March 11, 2020. The results indicate that for all five ETFs, the Chow Test showed that a structural break exists in the data. This suggests that there was a significant change in the data before and after March 11, 2020, for all five ETFs.

Table 12 showed the Roger Satchell test was conducted to determine the volatility of the ETFs before and after COVID-19. The T-test was used to find out the significance of the impact of COVID-19. The results indicate that for CPSE, there was an insignificant impact from the T-test that was conducted in the Roger Satchell test. For PSUBNK, NIFTYBEES, and BANKBEES, there was a significant impact from the T-test that was conducted in the Roger Satchell test. For SETFNIFTY, there was an insignificant impact from the T-test that was conducted in the Roger Satchell test.

In conclusion, the analysis suggests that the impact of COVID-19 on ETFs was not consistent across all ETFs. The CPSE, PSUBNK, NIFTYBEES, and BANKBEES ETFs were significantly affected by COVID-19 in terms of their closing price and value of volume traded, while the daily returns of all five ETFs were not significantly affected by COVID.

DEBT – ETF - India

T-Test

Table 13: Debt ETF - India - T-test

Debt – ETF - India			
	T-Test (Price)	**T-Test (DR)**	**T-Test (Value of Vol)**
GOLDBEES	**Significant**	Insignificant	**Significant**
LIQUIDBEES	Insignificant	Insignificant	Insignificant
JUNIORBEES	Insignificant	Insignificant	Insignificant
RRSLGETF	**Significant**	Insignificant	**Significant**
RELNV20	**Significant**	**Significant**	**Significant**

CHOW TEST

Table 14: Debt ETF - India - Chow Test

Debt – ETF – India	
	Chow Test
GOLDBEES	**Structural Break exists**
LIQUIDBEES	**Structural Break exists**
JUNIORBEES	No Structural Break
RRSLGETF	No Structural Break
RELNV20	No Structural Break

ROGER SATCHELL

Table 15: Debt ETF - India - T-Test for Roger Satchell

Debt – ETF – India	
	RS
GOLDBEES	**Significant**
LIQUIDBEES	Insignificant
JUNIORBEES	**Significant**
RRSLGETF	**Significant**

RELNV20	**Significant**

The research conducted on the debt-ETF category aimed to determine the impact of COVID-19 on the ETF industry. The category comprises GOLDBEES, LIQUIDBEES, JUNIORBEES, RRSLGETF, and RELNV20. To evaluate the impact, five different tests were used, including T-tests for the close price, daily returns, and value of volume traded Chow Test, and the Roger Satchell test.

The research findings suggest that the impact of COVID-19 on the debt-ETF category varied across different ETFs. For instance, GOLDBEES was significantly affected by the pandemic, as evidenced by the T-test for the close price and value of the volume traded. However, Table 13 showed daily returns were not significantly impacted. Similarly, RRSLGETF's price and trading volume were significantly affected by the pandemic, while daily returns had an insignificant impact. The findings for JUNIORBEES indicate that the ETF was not significantly affected by the pandemic, as all three tests had an insignificant impact.

On the other hand, the research showed that LIQUIDBEES was not significantly affected by the pandemic across all three tests. Conversely, RELNV20 was significantly impacted by COVID-19 in all three tests conducted. Therefore, it is evident that the impact of COVID-19 on debt ETFs was not uniform across the ETFs in the category.

Table 14 showed the Chow Test revealed a structural break in the data for GOLDBEES and RELNV20, indicating that the pandemic had an impact on the market structure. In contrast, JUNIORBEES and RRSLGETF had no structural break in the data, suggesting that the pandemic had no significant impact on the market structure for these ETFs. Furthermore, the Table 15 T-test conducted in the Roger Satchell test showed significant impacts for all the ETFs, suggesting that the pandemic had an impact on their performance.

In conclusion, the research findings indicate that investors need to consider the individual characteristics of each ETF before investing in them, particularly during times of market volatility such as a pandemic. Therefore, investors must conduct thorough research and analysis of each ETF to determine their risk appetite, investment goals, and expected returns. This information will help investors make informed investment decisions, particularly during times of market volatility.

Gold – ETF – UK

T-Test

Table 16: Gold ETF - UK - T-test

GOLD - ETF – UK			
	T - Test (Price)	**T-Test (DR)**	**T - Test (Volume)**
SGLD	**Significant**	Insignificant	**Significant**
LOGIN	**Significant**	Insignificant	**Significant**
PHAU	**Significant**	Insignificant	Insignificant

Chow Test

Table 17: Gold ETF - UK - Chow Test

GOLD - ETF - UK	
	Chow Test
SGLD	**Structural Break Exists**
LOGIN	**Structural Break Exists**

PHAU	No Structural Break

Roger Satchell

Table 18: Gold ETF - UK - T-test for Roger Satchell

GOLD - ETF - UK	
	RS
SGLD	**Significant**
LOGIN	**Significant**
PHAU	**Significant**

We were able to determine and deduce that both the SGLD and IGLN ETFs performed the same way by looking at the Gold-ETFs in the UK. Table 16, and Table 18 showed together with the Roger Satchell test, the T-test for close price and volume had a big effect on both of these ETFs. Table 17 showed these 2 ETFs have a structural change, as demonstrated by the Chow Test. The PHAU ETF did not exhibit a structural change and displayed negligible volume. For all 3 ETFs, the Daily Returns were insignificant.

Equity – ETF – UK

T-Test

Table 19: Equity ETF - UK - T-test

Equity - ETF - UK			
	T - Test (Price)	**T-Test (DR)**	**T - Test (Volume)**
FLGB	**Significant**	Insignificant	Insignificant
FXB	**Significant**	Insignificant	**Significant**
EWUS	**Significant**	Insignificant	Insignificant

Chow Test

Table 20: Equity ETF - UK - Chow Test

Equity - ETF - UK	
	Chow Test
FLGB	**Structural Break Exists**
FXB	**Structural Break Exists**
EWUS	**Structural Break Exists**

Roger Satchell

Table 21: Equity ETF - UK - T-test for Roger Satchell

Equity - ETF - UK	
	RS
FLGB	**Significant**

FXB	**Significant**
EWUS	**Significant**

We were able to determine and deduce that FLGB and EWUS ETFs performed identically by looking at the Equity - ETFs in the UK. Table 19 and Table 21 showed both the Roger Satchell test and the T-test for the close price had a substantial impact on these ETFs, but the volume traded for both of them was insignificant. Table 20 showed the Chow Test demonstrated the structural shift in all 3 ETFs. For all 3 ETFs, the Daily Returns were insignificant. FXB demonstrated relevance for the trading volume.

Debt – ETF – UK

T-Test

Table 22: Debt ETF - UK - T-test

Debt - ETF - UK			
	T - Test (Price)	**T-Test (DR)**	**T - Test (Volume)**
IBGL	**Significant**	Insignificant	**Significant**
ISXF	**Significant**	Insignificant	Insignificant
GLTY	**Significant**	Insignificant	**Significant**

Chow Test

Table 23: Debt ETF - UK - Chow Test

Debt - ETF - UK	
	Chow Test
IBGL	**Structural Break Exists**
ISXF	No Structural Break
GLTY	**Structural Break Exists**

Roger Satchell

Table 24: Debt ETF - UK - T-test for Roger Satchell

Debt - ETF - UK	
	RS
IBGL	Insignificant
ISXF	**Significant**
GLTY	**Significant**

Table 22 and Table 24 showed that IGBL and GLTY performed similarly except for the Roger Satchell volatility test. Close price and Volume showed significance and the Chow test showed structural break for both these ETFs. All 3 ETFs showed insignificance for Daily Returns. Table 23 shows that ISXF did not show a structural break.

9. CONCLUSION

The paper took sample ETFs from 3 different segments: Gold - ETF, Equity – ETF, and Debt – ETF. We can see in the Gold – ETF segment, that almost all the ETFs that were taken for the research performed similarly to each other before

and after COVID (March 11, 2020) except for HDFC ETF. Except for HDFC ETF all the other ETFs showed a structural break before and after COVID, which shows the economic shift had an impact on the ETFs. All the other parameters were the same for all the ETFs that were considered for Gold – ETF. In the case of Equity – -ETF segments, all the ETFs that were taken for the research performed distinctly from each other. In this segment, only CPSE ETF did not show a structural break before and after COVID-19. The SETFNIFTY ETF in Equity – ETF segment showed insignificant change in 4 other parameters, but showed a structural change, which is contradicting for the other 4 parameters. In the final segment, Debt – ETF, all the ETFs selected for the research performed significantly differently from each other. The LIQUIDBEES in the Debt – -ETF showed insignificant in 4 parameters, but showed structural change, on the other hand, RELNV20 showed significant change in 4 parameters but did not show structural change. JUNIORBEES showed insignificant in 3 parameters and structural break but showed significance in the volatility test. The study compared the performance of various ETFs in the UK using different tests. Results showed that some ETFs performed identically, while others had negligible volume or displayed structural changes. Daily returns were insignificant for all ETFs. Overall, the study provides insights into the performance and structural changes of ETFs in the UK market.

The major finding that was seen is that the Gold ETFs – India and Gold ETFs – UK performed more or less similarly. The T-test for close price and Roger Satchell test on both occasions showed significance, and the T-test for daily returns on both cases showed insignificance. But this was not the case with Equity ETFs and Debt ETFs of both these countries. The similarity was not that evident.

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