ORIGINAL ARTICLE

American hedge funds industry, market timing and COVID-19 crisis

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Abstract

This paper addresses two key issues relating to the interactions among the North American hedge funds industry, the equity and treasury bond markets during the COVID-19 pandemic. First, we examine the market-timing ability of North America hedge fund managers using eight strategies as well as the composite hedge fund index. Secondly, we analyze both the short- and long-term effects of both the North American equity and bond markets on the performance of the regional hedge funds industry while accounting for the effects of COVID-19 pandemic. Our results show no significant evidence of market return-timing ability of hedge fund managers across all the funds strategies during the pandemic. However, we document a strong evidence of the effects of the pandemic on the performance of fund managers, except for the Managed Futures and the Relative Value funds strategies. Secondly, we demonstrate that the COVID-19 pandemic may have significantly altered the long-term effects of the North American equity market on the performance of the hedge fund industry while the effects of the bond market is only significant in the short-term. We outlined some crucial implications of these findings for the decision-making process of hedge fund managers, investors as well as market makers during a health crisis-induced financial market turbulence.

Introduction

The COVID-19 pandemic has caused public health emergency since December 2019 and has severely affected the global economic activity (e.g., Bernanke., 2020). Given the magnitude of disruption in global economic activities, this has been considered as a global economic/financial crisis (see e.g., Mirza et al., 2020; Sharif et al., 2020). The effect has manifested in increased risk spillover across several financial instruments such as equities, mutual funds, commodities and cryptocurrencies (Corbet et al., 2020; Mzoughi et al., 2020; Ding et al., 2021; Urom et al., 2021). Besides,

Reinhart (2020) argue that the COVID-19 pandemic-related crisis differs from previous crisis in the nature of its cause and severity. This and other related conclusions have motivated an increasing research into the consequences of the COVID-19 global crisis on various asset classes including the hedge fund industry for several reasons. First, the hedge fund industry has experienced a rapid growth in recent years. As noted in Yong Chen (2005), hedge funds have experienced explosive growth in the past two decades and provide a fertile field to study active portfolio management. For instance, Cappocci and Hubner (2004) note that hedge funds emerged around 1950 and gained prominence in the 1990s, with about US$400 billion being managed in hedge funds in the U.S as at 2004 while Jordão and De Moura (2011) argue that by 2009, it has risen to approximately US$1.25 trillion.

Secondly, hedge funds are actively managed and are supposed to perform better and to have higher potential for timing ability than mutual funds and other financial assets particularly during market downturns. As noted in Tchamyou and Asongu (2017), market timing is the potential of a manager to seize the opportunity of market fluctuations

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to rebalance portfolio or change asset allocations. Market timing may also be seen as a type of dynamic strategy that adjusts risk exposure according to forecasts about the market that delivers abnormal market payoffs. Put differently, market timing consists of coordinated assets allocation strategy, which involves increasing (decreasing) portfolio exposure based on a forecast of a market oscillation, which results in a convex relation between fund returns and market returns. Indeed, many hedge funds pride themselves as skilled market timers when dealing with investors. These funds employ different dynamic trading strategies and capture the attention of many market actors, mainly in volatile financial markets. Furthermore, they have a major role in investment and management decisions. In this context, there has been an increasing interest to investigate the performance of this industry during crisis and non-crisis periods. Particularly, the ability of hedge fund manager to time market is considered as an added value and greater volatility may generate more enhanced market-timing opportunities (e.g., Aiken et al., 2016).

The abilities of hedge fund managers has recently gained increasing attention, mainly those originating from volatility, liquidity and market conditions with a focus on past financial crisis such as the global financial crisis of 2007-2009. However, a very few empirical studies have considered the impact of the COVID-19 induced financial market crisis on the timing abilities of funds managers. For example, Mirza et al.,(2020) examined the volatility timing of European investment funds during the COVID-19 pandemic. They demonstrate that among the investment funds considered, only the social entrepreneurship funds exhibited both performance and volatility timing during the outbreak of Covid-19. To our best knowledge, no previous studies have considered on the timing skills of North America hedge funds managers during the COVID-19 pandemic. Thus, our study is the first empirical analysis to find whether North America hedge fund managers exhibited the ability of market-timing during this pandemic.

The choice of North American hedge funds is motivated by several reasons. First, the North America hedge funds market are managed by highly skilled managers and has witnessed significant growth over the last two decades. Besides, over this period, many sophisticated managers have joined the industry and hence, it is crucial to examine whether these managers possess the skills to time market conditions. Secondly, the high level of infections (deaths) as well as the continued spread of the COVID-19 in this region supports the use of the North America hedge funds industry as an appropriate benchmark for the analysis of market-timing ability of hedge funds manager during a health crisis-induced financial markets turbulence. Moreover, we extend our analysis by investigating the short- and long-term effects of North America equity and treasury bonds markets on the performance of the hedge funds industry while accounting for the impact of the COVID-19 pandemic on the financial markets.

The remainder of the paper is organized as follows. Section "Literature review" presents an overview of the theoretical framework related to hedge funds timing abilities. Section "Data and methodology" illustrates methodology. Section "Data" describes the data and variables. Results are reported in Section "Methodology" while section "Results and discussion" concludes.

Literature review

Following the pioneering work of Cowles (1933), a large stream of research has emerged seeking to offer convincing answer to the question about the ability of highly skilled funds managers to forecast and take advantage of changes in market conditions. Indeed, Charles Cao et al. (2013) argue that over the last seven decades, an expanding literature on market-timing ability has surfaced, employing both linear and nonlinear empirical techniques with and without adjusting information have been proffered to identify the presence of market timing skills. Among the early works, the empirical framework of Treynor and Mazuy (1966) has been widely applied as a baseline framework for measuring market timing by investigating whether fund managers readjust their portfolio exposure following market performance forecast. Using this framework on a sample of 57 funds between 1957 and 1962, these authors detected evidence of market timing ability only in one fund and concluded that investment managers cannot outguess the market.

Tchamyou and Asongu (2017) argue that a substantial number of empirical studies have documented similar conclusion of negligible evidence of market timing, especially across different investment fund levels. For example, Kon (1983) detected significant evidence of market timing at the individual fund level but no evidence when funds are grouped while Mansor et al. (2015) examined 106 Malaysian equity funds and document the disappearance of the evidence of market timing when panel regressions are used. Relying on this framework, several other approaches have been introduced for examining market return-timing as well as volatility-timing abilities of fund managers (see e.g., Jagannathan & Korajczyk 1986; Ferson & Schadt 1996; Jiang et al. 2007; Chen, Ferson 2010; Mirza et al. 2020).

Hedge funds follow directional and non-directional dynamic strategies leading to time-varying beta exposures on different factors such as equity markets conditions and leverage (see e.g., Osinga et al. 2021). During the last two decades, several empirical studies such as Shauten et al. (2015) investigated the drivers of these dynamics. Particularly, more recent strand of the literature has focused on the

ability of liquidity timing. For instance, Cao et al. (2013) found evidence of liquidity timing skills among hedge fund managers. This result is consistent with Ben Khelifa and Hmaied (2016) who demonstrated that European hedge funds time stock market liquidity especially during liquidity crisis. Moreover, Luo et al. (2017) suggested that the liquidity timing abilities of hedge funds investing in the foreign exchange market may be explained by their investment styles and the types of their assets management. Besides, they indicated that currency hedge funds and systematic futures hedge funds display different liquidity timing abilities.

Furthermore, Li et al., (2019) argued that the variations in timing behavior of hedge funds investing in foreign investment assets are explained by the liquidity condition. Wattanatorn et al. (2020) suggested that high-performing fund managers exhibit significantly positive liquidity timing skills while low-performing fund managers don't demonstrate this behavior. Siegmann and Stefanova (2017) found evidence that equity- oriented hedge fund managers possess liquidity timing ability after the major market microstructure evolution in the year 2000. Recently, the empirical evidence supports the notion that hedge fund managers time market volatility. Even more, Racicot et al. (2021) captured the sensitivity of hedge funds' return higher moments to macroeconomic and financial shocks. Namvar et al. (2016) focused on the systematic risk management and showed that the allocation of hedge fund management effort varies across the business cycle.

Moreover, numerous studies highlight the ability of market-timing in hedge fund market, especially during financial crisis. For instance, Aiken et al. (2016) emphasizes that global hedge fund managers time global emerging markets equities only during the financial crisis and subsequent recovery. Also, Dragomirescu-Gaina et al. (2021) observed that market-timing requires accepting lower accuracy levels. Bali et al. (2019) concluded that the maximum monthly returns of hedge funds predicts cross-sectional differences in future fund returns. Osinga et al. (2021) showed that nearly 34% of hedge funds display factor timing ability, focusing mainly on the market, size and bond factors. Lastly, Zheng et al. (2018) examined a new facet of hedging ability. Their results indicate that hedge fund managers adjust the market exposure of their funds to variation of market sentiment.

Data and methodology

Data

This study uses monthly American hedge funds indices. The dataset is extracted from the Eurekahedge database which classifies the North America hedge fund into eight strategies, namely North America Arbitrage hedge fund (AHF), North

America CTA/Managed Futures hedge fund (CTA/MFHF), North America Distressed Debt hedge fund (DDHF), North America Event Driven hedge fund (EDHF), North America Fixed Income hedge fund (FIHF), North America Long Short Equities hedge fund (LSEHF), North America Multi-Strategy hedge fund (MSHF) and North America Relative Value hedge fund (RVHF). Each hedge funds strategy is represented by an index while all the American hedge funds are approximated by a composite index known as the North American Hedge Fund Index (NAHF). The NAHF is an equally weighted index of 475 constituent funds, which is designed to provide a broad measure of the performance of underlying hedge fund managers who invest exclusively in North America. Besides, our study focuses on North American stock market using the Morgan Stanley Composite Index (MSCINA) for the North America region, which we retrieve from the MSCI database MSCI. In order to approximate the risk free rate, we use monthly averages of the 3-month U.S. treasury bill index (USTB), which is extracted from the spglobal database. Our study covers the period April 2011 to April 2021, totaling 121 months. We measure the return of each index as follows: $R_i = \ln(P_t/P_{t-1})$, where P_t is the value of the index at time t, while P_{t-1} is the value at date $t-1$.

In Table 1, we show the descriptive statistics for all the returns series used in our analysis. As may be seen, among the hedge funds, the North America Long Short Equities hedge fund possess the highest mean return of about 0.72% while North America CTA/Managed Futures hedge fund has the least of about 0.42% mean return over the study period. The mean return for the market portfolio as shown by MSCI North America is about 0.99% while the return on the t-bill is 0.21%. However, as shown by the standard deviation, the U.S t-bill (0.009) is the least volatile while the MSCI North America (0.04) is the most volatile among all the series for this study. Among hedge funds, the North America Event Driven hedge fund (0.0286) is the most volatile while North America Arbitrage hedge fund (0.0098) is the least. Also, all the time series are negatively skewed except the North America CTA/Managed Futures hedge fund (NACTA/MFHF) and the U.S t-bill index. This suggests that most of the return series have their tail extended towards the left, indicating departure from the normality condition. Besides, all series have their kurtosis coefficient in excess of 3 as shown by positive ex-kurtosis values. Lastly, the last column of Table 1 displays the unit root tests on all the return series at their first difference using the Augmented Dickey-Fuller (ADF) test. The results indicate that all the series become stationary at first difference suggesting that they are integrated of order one, hence, confirming the appropriateness of the empirical approaches adopted in this study.

Figure 1 shows the evolution of the return series over the sample period while Fig. 2 shows the correlation heap map. As may be seen in Fig. 1, the effects of

Table 1 Descriptive statistics

Index	Mean	Min	Max	Std. Dev	Skew.	Ex. Kurt.	ADF
NAHF	0.0060	− 0.0769	0.0633	0.0168	− 0.6873	5.3424	− 16.9630
NAAHF	0.0043	− 0.0332	0.0450	0.0098	− 0.3879	4.6831	− 20.4790
NACTA/MFHF	0.0042	− 0.0216	0.0638	0.0104	1.6149	8.0782	− 19.1310
NADDHF	0.0059	− 0.1058	0.0781	0.0206	− 0.9384	7.4762	− 18.8250
NAEDHF	0.0064	− 0.1545	0.0851	0.0286	− 1.2852	7.5271	− 17.6320
NAFIHF	0.0055	− 0.1222	0.0303	0.0142	− 6.0373	52.6910	− 16.6380
NALSEHF	0.0072	− 0.1035	0.0917	0.0249	− 0.4515	3.7897	− 17.4360
NAMSHF	0.0050	− 0.0917	0.0625	0.0184	− 1.0589	6.3188	− 17.3420
NARVHF	0.0061	− 0.0634	0.0781	0.0205	− 0.4326	2.5512	− 17.3270
MSCINA	0.0099	− 0.1330	0.1298	0.0400	− 0.3349	1.6637	− 18.069
USTB	0.0021	− 0.0237	0.0300	0.0090	0.5238	0.7565	− 18.020

ADF stats denotes the Augmented Dickey–Fuller (ADF) test with the null hypothesis defined as "the series has a unit root against the alternative of stationarity". All unit roots test are done with a constant and a time trend with *** denoting significance at 1% level
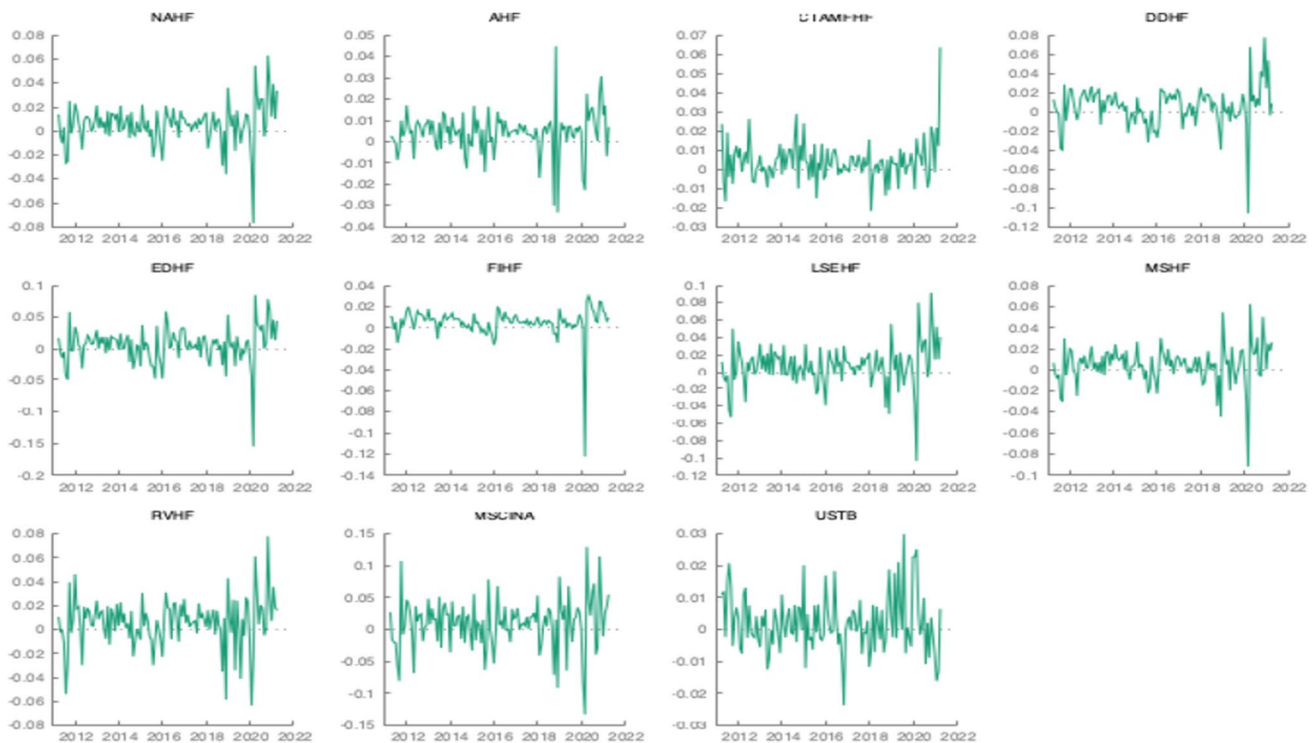

Fig. 1 Plots of return series

the COVID-19 pandemic is exhibited by all the series in the form of increased level of volatility, especially during the first wave of the pandemic that occurred in the early months of 2020. The key take-away from the correlation matrix is that all the hedge fund strategies and the MSCINA possess negative correlations with the U.S. bond market, except for the CTA/Managed futures hedge fund that has a positive correlation with the bond market. It is also worth-nothing that the CTA/Managed futures hedge fund has the least correlation with the rest of the hedge fund strategies while the long Short Equities hedge fund has the strongest correlation with both the North America equity market as well as the bond market.

Methodology

In the first step of the empirical methodology for this study, we build a model with which we investigate whether hedge
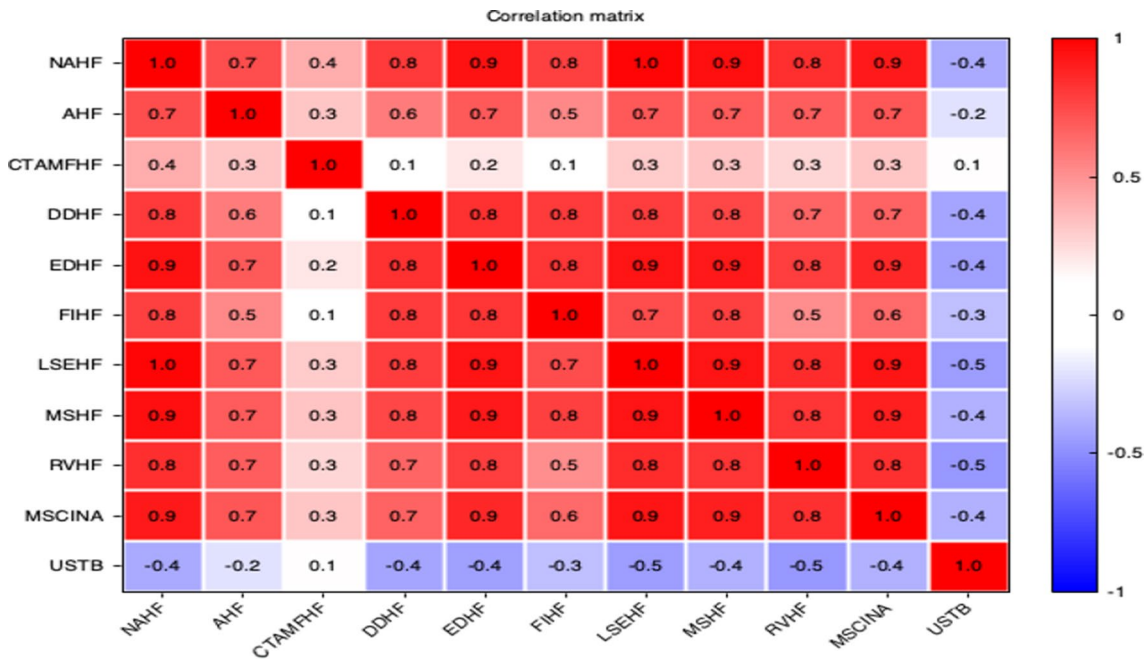
Fig. 2 Correlation matrix

funds' managers can time stock market returns based on the model proposed by Treynor-Mazuy (1966). Traditionally, a timing model is built using the classical Capital Asset Pricing Model (CAPM) of Sharpe (1966), which predicts that an asset's excess return, *p* may be determined by its correlation with the market portfolio's excess return. Following this, the model for this study unfolds as follows:

$$R_{p,t+1} - R_{F,t+1} = \tau_p + \delta_{p,t+1}\left(R_{M,t+1} - R_{F,t+1}\right) + \varepsilon_{p,t+1} \qquad (1)$$

$$\delta_{p,t+1} = \delta_1 + \delta_p\left(R_{M,t+1} - R_{F,t+1}\right) \qquad (2)$$

where $R_{p,t-1}$ is the return on a hedge fund index; $R_{M,t+1}$ is the return on the North American portfolio while $R_{F,,t+1}$ is the return on a risk-free short-term asset; τ_p is the intercept; $\delta_{p,t+1}$ is the coefficient of the market beta while is the random error term. Essentially, the model above concerns the expected return of each hedge fund strategy to the risk-free rate and the market risk premium. For this study, we use the U.S. treasury bond index as the risk-free rate while the MSCI North America is the market portfolio.

Hence, the market-timing ability is estimated using the following equation:

$$\begin{aligned} R_{p,t+1} - R_{F,t+1} &= \tau_p + \delta_1\left(R_{M,t+1} - R_{F,t+1}\right) \\ &+ \delta_p\left(R_{M,t+1} - R_{F,t+1}\right)^2 * COVIDt + \theta COVIDt + \varepsilon_{p,t+1} \end{aligned} \qquad (3)$$

where δ_p represents the market timing factor. When this coefficient is significant and positive, the hedge fund manager is assumed to be successful in predicting market changes to generate an increase in the hedge fund return during the COVID-19 pandemic. The model also incorporates a COVID-19 factor θ, which enables us to predict the potential impact of the health crisis on the returns of hedge funds. This is a dummy variable, which takes the value of 1 during the COVID-19 pandemic and 0, otherwise.

In the second step, we apply An ARDL model to investigate the dynamic connection between American hedge funds, American stock market and American bond market during COVID-19 Crisis. First, we employ the ARDL bounds test for cointegration proposed by Pesaran and Smith (1995) and Pesaran et al. (2001) to examine whether there is long-term causal relationship between American hedge funds and the two market during COVID-19 Crisis. To achieve this, the following model is estimated:

$$\Delta \ln NAHF_t = \delta_0 + \sum_{i=1}^{p} \delta_1 \Delta \ln NAHF_{t\,t-i}$$
$$+ \sum_{i=1}^{p1} \delta_2 \Delta \ln MSCINA_{t-i} + \sum_{t=1}^{p2} \delta_3 \Delta \ln USTB_{t-i} + \sum_{i=1}^{p3} \partial_4 \Delta COVID_{t-i} + \sum_{i=1}^{p4} \delta_5 \Delta (\ln MSCINA * COVID)_{t-i} \quad (4)$$
$$+ \sum_{i=1}^{p5} \delta_6 \Delta (\ln USTB * COVID)_{t-i} + \propto_1 COVID_{t-1} + \propto_2 \ln NAHF_{t-1} + \propto_3 \ln MSCINA_{t-1} + \propto_4 \ln USTB_{t-1}$$
$$+ \propto_5 (MSCINA * COVID)_{t-1} + \propto_6 (\ln USTB * COVID)_{t-1} + \varepsilon_t$$

where $lnNAHF$ denotes log return on North American hedge fund index; $MSCINA$ is the log return on MSCI North American index while $USTB$ is the log return on 3-month U.S. treasury bill index. Moreover, $lnMSCINA*COVID$ and $lnUSTB*COVID$ represent the interaction terms for the performance of MSCI North America and the COVID-19 dummy and that of the USTB and the COVID-19 dummy, respectively. δ_1 to δ_6 denote short-term dynamic relationships while $\propto_1$ to $\propto_6$ are the associated long-run dynamic relationships. Lastly, p_1 to p_5 are the maximum lag orders.

The long-term equilibrium relationship between variables can be analyzed using F-statistics as follows:

H0: $= \propto_1 = \propto_2 = \propto_3 = \propto_4 = \propto_5 = \propto_6 = 0$: there is no cointegration relationship
H1: $= \propto_1 = \propto_2 = \propto_3 = \propto_4 = \propto_5 = \propto_6 \neq 0$: there is cointegration relationship

Then, we apply the ARDL modelling approach to examine the long and short-term relationships between the variables. Assuming that there is no cointegration, the ARDL model is presented as follow:

$$\Delta \ln NAHF_t = \delta_0 + \sum_{i=1}^{p} \delta_1 \Delta \ln NAHF_{t\,t-i} + \sum_{i=1}^{p1} \delta_2 \Delta \ln MSCINA_{t-i}$$
$$+ \sum_{t=1}^{p2} \delta_3 \Delta \ln USTB_{t-i} + \sum_{i=1}^{p3} \partial_4 \Delta COVID_{t-i}$$
$$+ \sum_{i=1}^{p4} \delta_5 \Delta (\ln MSCINA * COVID)_{t-i} + \varepsilon_t$$

However, if there is no cointegration, the error correction model (ARDL-ECM) is estimated as:

$$\Delta \ln NHFA_t = \delta_0 + \sum_{i=1}^{p} \delta_1 \Delta \ln NHFA_{t\,t-i} + \sum_{i=1}^{p1} \delta_2 \Delta \ln MSCINA_{t-i}$$
$$+ \sum_{t=1}^{p2} \delta_3 \Delta \ln USTB_{t-i} + \sum_{i=1}^{p3} \partial_4 \Delta COVID_{t-i}$$
$$+ \sum_{i=1}^{p4} \delta_5 \Delta (\ln MSCINA * COVID)_{t-i}$$
$$+ \sum_{i=1}^{p5} \delta_6 \Delta (\ln USTB * COVID)_{t-i} + \gamma ECT_{t-1}$$

$$(5)$$

where γ denotes the speed of adjustment parameter while ECT is the error correction term. δ_1 to δ_6 represent short-term dynamic coefficients of the model's adjustment to long-run equilibrium.

Results and discussion

In this section, we present the estimation results from the empirical analysis as discussed in the previous section. First, we present results for the market-timing ability of hedge funds managers during the COVID-19 pandemic as shown in Eq. 3. Then, we proceed with the ARDL model, which enables us to examine both the short and long-term effects of the COVID-19 pandemic on the performance of North America hedge funds as shown in Eq. 4 to Eq. 5.

Estimation results of market-timing model

In Table 2, we present the empirical results from the market-timing model as defined in Eq. 3. As in past studies, when the market-timing factor is positive and significant,

Table 2 Test of market timing ability during the COVID-19 pandemic

Index	τ_p	δ_p	δ_p	θ	R-sq.
NAHF	−0.0004	0.4384***	−1.4639***	0.0135***	0.87
	(−0.5400)	(21.540)	(−3.7200)	(3.2100)	
NAAHF	0.0001	0.2509***	−0.9873***	0.0064*	0.65
	(0.0700)	(11.130)	(−2.7900)	(1.6600)	
NACTA/MFHF	0.00002	0.1657***	−0.3461	0.0074	0.38
	−0.0300	(5.8800)	(−0.5500)	(1.4500)	
NADDHF	−0.0003	0.3976***	−2.7320***	0.0216**	0.62
	(−0.2600)	(10.190)	(−3.0500)	(2.5200)	
NAEDHF	−0.0015	0.6432	−2.7647***	0.0205***	0.83
	(−1.17)	(18.690)	(−3.1300)	(3.4200)	
NAFIHF	0.0014	0.2852***	−3.5062***	0.0168***	0.75
	(1.6100)	(8.5100)	(−3.7600)	(3.9800)	
NALSEHF	−0.0009	0.6158***	−1.3157***	0.0151***	0.89
	(−0.9800)	(25.690)	(−2.6300)	(3.0400)	
NAMSHF	−0.0009	0.4665***	−1.4850***	0.0090**	0.85
	(−1.0000)	(20.260)	(−3.1600)	(2.3200)	
NARVHF	−0.0004	0.5069***	0.3376	0.0020	0.75
	(−0.3300)	(13.190)	(0.4600)	(0.3800)	

an asset manager is assumed to be successful in market-timing (see e.g., Treynor and Mazuy, 1966; Jordão and De Moura, 2011). In this study, the market-timing factor is represented by δ_p. As may be seen in Table 2, the coefficient of market-timing factor (δ_p) is negative and significant for all North America hedge fund strategies, except for the North America CTA/Managed Futures and North America Relative Value hedge funds whose coefficients are not statistically significant.

This suggests that North American hedge fund managers may not have exhibited the ability to effectively forecast market changes during the period of financial market turbulence under the COVID-19 pandemic. With particular reference to hedge fund managers, many previous studies have found similar results (see e.g., Do et al., 2005; Jordão and De Moura, 2011; Joaquim and De Moura, 2011; Ang et al., 2014). However, this is not in line with Chen and Liang (2007); Sherman et al. (2017) and Osinga et al.,(2021) that focus on examining America hedge fund managers' market volatility timing ability. These studies document strong market-timing ability, especially during volatile market conditions.

Further, the coefficient associated with the COVID-19 pandemic is positive and significant for all the America hedge funds, except for the North America CTA/Managed Futures and North America Relative Value hedge funds. This suggests that with the exception of these two hedge fund strategies, the COVID-19 pandemic has had a significant effect on the performance of most North America hedge funds. Similar effects of the pandemic on other financial

Table 3 Lag selection

Index	LR	FPE	AIC	HQIC	SBIC
NAHF	1	1	1	1	1
MSCINA	1	1	1	1	1
USTB	1	1	1	1	1
COVID	1	1	1	1	1
COVID*MSCINA	1	1	1	1	1
COVID*USTB	1	1	1	1	1

asset classes including conventional equities, currencies and commodities have been variously reported by past studies. This has been largely attributed to increase in uncertainty and risk levels in the global economic and financial conditions, especially at the beginning of the health crisis. However, as noted in Jordão and De Moura (2011), the CAPM with market timing factor seeks to capture a fund manager's ability to predict the market no matter if market changes are positive or negative since the market excess return is squared. This is because the fund manager has the potential to take benefit of both the upwards and downwards movements of the market through adjusting their funds' market exposure. Taken together, these results indicate that during the rise and the fall of market returns during the COVID-19 pandemic, a majority hedge funds strategies did not exhibit the ability to achieve superior returns and to outperform the benchmark (or market portfolio) and the risk-free rate during the global health crisis.

Table 4 ARDL Bounds test

H0: No levels relationship								
F statistic	5.139							
t statistic	− 2.263							
Critical values (0.1–0.01)								
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	10%	5%	2.50%	1%				
k_3	2.26	3.35	2.62	3.79	2.96	4.18	3.41	4.68

Table 5 Estimation results of ARDL model

Dependent variable: North American Hedge Fund Index ARDL(1,1,0,0,1,1) regression Explanatory variables	Coefficients
Long term	
MSCINA	(0.5606)***
	(12.030)
USTB	0.0532
	(0.1900)
COVID	− 14.21
	(− 1.3700)
COVID*MSCINA	0.7157**
	(2.2700)
COVID*USTB	1.3691
	(1.0000)
Short term	
Δ(MSCINA)	0.2867***
	(11.900)
Δ(COVID*MSCINA)	0.0793***
	(2.7900)
Δ(COVID*USTB)	− 0.1042***
	(− 2.7400)
Adjustment term	
ECT (- 1)	− 0.0869**
	(− 2.2600)
R-Sq.	0.89

Estimation results from the ARDL model

In this subsection, we present and discuss the empirical results on the short and long-term effects of the North American equity market (MSCINA), the bond market (USTB) and COVID-19 pandemic on the performance of North American hedge funds using the ARDL model as defined earlier. Following past studies, we begin by selecting the optimal lag order for each of the variables included in the analysis. As shown in Table 3, we determine the optimal lag order for each variable based on the following information criteria:

Likelihood Ratio (LR); Final Prediction Error (FPE); Akaike Information Criterion (AIC); Schwarz–Bayesian Information Criterion (SBIC); and the Hannan–Quinn Information Criterion (HQIC). As may be seen in Table 3, all the information criteria suggest that 1 is the maximum lag order for all the variables.

We proceed to perform a co-integration test to establish the existence (or not) of a cointegration relationship among the variables using the Bounds testing approach to cointegration approach of Pesaran et al. (2001). Results from the bounds test is presented in Table 4. Indeed, the estimated F-statistic of 5.139 is higher than the critical values, indicating that there is cointegrating relationship among all variables. Hence, we reject the null hypothesis of no cointegration, suggesting the existence of long-run relationship among North American Hedge Fund, MSCI North America index, U.S. t-bill index, the dummy associated with the COVID-19 pandemic and the interaction terms.

Before estimating the baseline ARDL model, the optimal lag order of each variable in the model is determined using the SBIC. Many past studies have used various criteria to select the most suitable maximum lag-length (see e.g. Malik et al., 2020; Khelifa et al., 2021). Following the length of our data sample and the maximum lag order of 1 for each variable, the matrix list (110011) for the ARDL model has been chosen using the SBIC as the most appropriate lag order for the associated variables. The results of the ARDL model estimation is presented in Table 5 with coefficients and associated *t*-values in parentheses. As may be seen in Table 5, the coefficient associated with MSCINA is positive and statistically significant in both the short- and long-terms. This suggests that North American hedge funds managers allocate to MSCI North America in both the short- and long-terms. Moreover, the coefficient is higher in the long-term, indicating a stronger long-term impact of the changes of MSCI North America on the performance of North America hedge fund managers. Specifically, a 1% increase in the value of MSCI North America index by may lead to about 28% - 56% increase in the value of North American hedge fund index.

Also, the coefficients associated with the bond market, the COVID-19 dummy as well as the interaction term between

these variables are not significant in the long-term. However, the interaction term associated with MSCI North America and the COVID-19 dummy are positive and significant, with a coefficient of about 72% in the long-term. This indicates that the effect of the COVID-19 pandemic on the performance of MSCI North America may have had a strong impact on the performance of North America hedge funds. This suggests that although the effects of the pandemic on the performance of hedge funds may have been insignificant, its effects on MSCI North America had a stronger impact on the performance of North America hedge funds than it had before the crisis period. This is also indicate that COVID-19 crisis may have significantly enhanced the impact the MSCI North America index value on Hedge Fund Index value in the long term.

However, the coefficient associated with the interaction term between COVID-19 and U.S. treasury bill index appear not to be statistically significant in the long term, while it is positive and significant in the short term, suggesting that the pandemic may alter the effect of the bond market on hedge funds value only in the short term. Besides, the interaction term between MSCI North America and the COVID-19 dummy has a weaker short term effects on North America hedge funds index with a coefficient of about 7.9% while the coefficient of the interaction term between the bond market and the COVID-19 dummy is significant and negative (about -10.4%). This suggests that the bond market may have had a short-term negative affect on the performance of North America hedge funds during the COVID-19 pandemic. Lastly, as expected, the coefficient associated with the one period lag of the Error Correction Term, ECT(-1) is negative and statistically significant (-0.087). This indicates that there is a long-term interdependence between the performance of North America hedge funds and the associated regressors. Therefore, when there are short-term deviations from long-term equilibrium, there is a potential of an adjustment intensity of about 8.70% back to the long-term equilibrium relationship.

Conclusion

With the potential for high average performance over benchmark financial assets, hedge funds have become more and more attractive to both individual and institutional investors such as American fund managers. Thus, it has been well demonstrated that hedge funds employ dynamic trading strategies and market-contingent bets that expose them to various degrees of risks, especially during market downturns such as the recent global economic and financial crisis caused by the on-going COVID-19 pandemic. In this paper, we analyze the connection between North American hedge funds, American stock market and America treasury bond market during the COVID-19 pandemic. Firstly, we investigate the market-timing ability of America hedge funds during the COVID-19 pandemic and the effects of the pandemic of market-timing potential using the aggregate hedge funds strategies categories.

Secondly, we extend our analysis by examining the effects of changes in the performance of both the North America equity and bonds markets on the performance of North America hedge funds during the COVID-19 pandemic using an ARDL-ECM model. The results from our analysis are as follows: first, we document strong evidence of the absence of market-timing ability of North America hedge fund managers but a significant impact of the COVID-19 pandemic on the performance of American hedge funds, except for CTA/Managed Futures and Relative Value hedge funds. This is shown by statistically significant negative coefficients associated with the market-timing factor for all the hedge funds and significant positive coefficients associated with the COVID-19 pandemic. Secondly, our empirical evidence also reveals that COVID-19 crisis has had a significant boost on the effect of changes on the North American equity market index on the performance of North American hedge funds, especially in the long term. Moreover, the pandemic may have enhanced the impact of the treasury bond market on the performance of hedge funds, only in the short term. Lastly, we also document a potential of adjustment to long-term equilibrium, following short-term deviation from long-term equilibrium.

To conclude, our analysis of market return-timing ability of North America hedge funds managers during the COVID-19 pandemic has important implications for the decision-making process of hedge fund managers, investors as well as market makers during economic/financial crisis periods. For instance, our analysis of North America hedge funds managers' market-timing ability underscores the importance of effective prediction and integration of market return conditions in asset allocation and investment decision making during periods of increased financial market turbulence due to global health crisis such as the COVID-19 pandemic. Moreover, our further analysis highlights the crucial implications of the short- and long-term effects of changes in both the North America equity and bond markets' returns on the performance of North America hedge funds due to financial market crisis induced by global health crisis.

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