THE ASSOCIATION BETWEEN DEPRESSION AND ANXIETY, AND STOCK MARKET INVESTMENTS IN THE UNITED STATES

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ABSTRACT

Purpose:
The objective of this paper is to examine whether there is an association between depression and anxiety, and stock market investments in the United States.

Methodology:
The average Google search volume for fifty search terms on depression and anxiety is considered as the proxy for depression and anxiety affected investors searching for information. Fama-French common risk-factor regression with dummy variables is used to understand the association between depression and anxiety, and stock market investments under different market conditions. The population of this study consists of all users of Google search engine in the United States.

Findings:
The results show that depression and anxiety as proxied by search volume is positively and significantly associated with stock market returns. The relationship is also significant when investors gain in the current period after making losses in the previous period. The association (positive) between depression and anxiety and, stock market investments is more pronounced during up-trending markets. However, the association (negative) between stock market investments and the depression and anxiety becomes significant as depression and anxiety reduces when the investors' return increases in a neutral market and it increases when the investors' return is less than or equal to the risk-free rate.

Conclusion:
Unless properly addressed, by making available investor education and counseling, depression and anxiety among investors may lead to severe economic consequences. It may also lead to a series of unhealthy and risky coping strategies to deal with regard to stock market investments under different market conditions (e.g. declines to rising). Since the extent of exposure to depression and anxiety differs gratefully between bull and neutral market conditions, timing is of utmost importance for investor education and counseling programs in policymaking.

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1. Introduction

Stock market in the United States has been subject to a greater degree of turbulence over the last two decades. Investing in stock market is not easy as placing a deposit in a bank and comfortably waiting until it matures because stocks must be continuously monitored as they are exposed to risk of price fluctuation. When the instability of investment income violates the fundamental human need for safety (Maslow, 1943), it creates enormous amount of stress until the initial investment is recovered (Qin et. al., 2019). Volatility in stock price changes not only creates anxiety but also the depression due to loss of money, particularly in the case of a crisis (McInerney et al., 2013). Many papers find that decline in stock prices has a profound negative impact on healthy behavior of people (e.g. Cotti et al., 2015; Engelberg and Parsons, 2016). Also, researchers have shown that decline in wealth of investors significantly impacts the health outcome (Schwandt, 2014; Lin et al., 2014). Nemours papers in the medical internet research literature find a significant relationship between online search behavior on various diseases and public health (Cho et al., 2013; Choi et al., 2016; Gamma et al., 2016; Bragazzi et al., 2017; Mendonça et al., 2018; Phillips et al., 2018). Stock market investors face a higher risk of anxiety and depression than that of the investors of other classes of assets because they are exposed to uncertainty of significant price fluctuations which results in severe losses or gains. Depression and anxiety symptoms can present not only when stock prices fall but also when the stock prices climb or rebound (Qin et. al., 2019).

Depression and anxiety has become a common disorder among financial market participants. When confronted with uncertainty in financial decision making, financial markets tend to be more volatility (Qin et. al., 2019) and investors often suffer from anxiety and depression in investing/trading under the condition of risk. Disorders such as anxiety and depression are not exposed to public due to possible impact on image and the character of the person seeking support and medication. As such, people diagnosed (or suspected to be diagnosed) with anxiety and depression usually seek information on identification and medication for the disease online before approaching other sources of information. Taking volume of Google search queries as a proxy for search behavior on depression and anxiety, Tefft (2011) studies the relationship between unemployment and, depression and anxiety in the US around the recession time. He finds that the Google search queries are positively correlated with unemployment level of the United States. People usually tend to search for information if they suspect that they are diagnosed with sensitive disorders such as depression and anxiety. In many instances, people are reluctant to see a doctor or even visit a treatment center due to possible image or status impact of disease (Croft et. al., 2009). Therefore, the most convenient way to understand and compare their own experience with symptoms and medications for depression and anxiety is to search related information online.

Examining the association between online health information search behavior and health related disease is not new in this section of health economics. Numerous papers have utilized search queries processed by search engines to examine the online search behavior of people on various search terms (See e.g. Ginsberg et. al., 2009; Gamma et. al., 2016; Mendonça et. al., 2018). Except for a handful work examining the relationship between depression and stock market investment using surveyed data such as hospitalizations

records (Schwandt, 2014; Lin et. al., 2015), the linkage between online search behavior on depression and anxiety in the United States and stock market investments using Google search queries has not been broadly documented with facts. As opposed to those of the previous findings on the negative relationship between mental health and stock return, Qin et. al., (2019) show that there is a positive association between stock market turbulence (in up-market and down-market) and anxiety. They attribute their findings to the fact that the investors tend to be concerned about the possibility of making losses even in a bull market. These claims can be testified by designing a study covering a larger population. The recent evidence suggests that people become more hostile to trade when they are exposed to depression and anxiety caused by economic factors (including losses/decline in the value of investments) such as Great Recession (see especially Mansfield et al., 2019). Conversely, the depression and anxiety may provide incentives for the investors to trade in large volumes of stocks following losses to perform better than past by making correct investment decisions (learning from mistakes). This particular research question is also examined in this study. Along the same line, Rachlin (1990) and many others have shown that the gambling behavior of individuals is more intensive following significant losses.

The purpose of this research is to understand the association between stock market investment and, depression and anxiety using Google search query data for the United States. This study is designed to uncover the reasons for the positive relationship between stock market fluctuations and, depression and anxiety under different market conditions. This study also provides economic and psychological justifications for the underlying observations. In addition, this study covers a larger population than the previous studies (i.e. the US population, expect for those who do not have accesses to internet or those who do not use Google as the internet browser).

2. Materials and Methods

In order to examine the association between depression and anxiety and stock market investments, this paper utilizes the Fama and French (2015) five-factor model instead of running a simple regression on Eviews statistical software. Firstly, the average value of the Google trend data are introduced into the above five-factor model and then the dummy variables are introduced to understand how the magnitude of the association between depression and anxiety and stock market investments varies under different market conditions. The behavior of investors can be understood by examining how the investor return (i.e. stock return) varies over time (Fama 1970). Although there are various methods available for modeling stock return, Fama and French (2015) five-factor model provides the best approximation to the true underlying return variation process of common stocks.

$$RP_t = \phi + \psi_1 SMB_t + \psi_2 HML_t + \psi_3 RMW_t + \psi_4 CMA_t + \varepsilon_t \quad (1)$$

RP_t is the market risk premium of the United States which is computed as the value-weighted return of all firms incorporated in the United States and listed on the NYSE, American Stock Exchange, or NASDAQ, minus the US one-month treasury bill rate. SMB is the return on a well diversified portfolio of small stocks minus diversified portfolio of big shares. HML is the return on diversified portfolios of high book to market

value shares minus a diversified portfolios of low book to market value shares and RMW is the difference between the return on diversified portfolios of shares with robust profitability minus weak profitability. CMA is the difference between the return on diversified portfolios of conservative investment shares and aggressive investment shares.

A proxy is needed for depression and anxiety, presumably, a variable that more fully reflects search behavior of investors seeking information on diagnosis and medication for depression and anxiety. It is not possible to use survey method to gather data pertaining to this research, given the extent of coverage, financial and time constraints. Therefore, the most suitable proxy available for this purpose is the search queries processed by the search engines such as Google on related search terms.
In order to examine the association between depression and anxiety disorder, and stock market investments, the average value of the Google search volume is introduced into the equation (1) above. The equation can be rewritten as follows.

$$RP_t = \phi + \psi_1 SMB_t + \psi_2 HML_t + \psi_3 RMW_t + \psi_4 CMA_t + \psi_5 GSV_t + \psi_6 IFR_t + \psi_7 UER_t + \varepsilon_t \quad (2)$$

Under null hypothesis that the depression and anxiety is significantly associated with stock market investments in the United States, the coefficient ψ_5 should be positive and statistically significant. The main reason for considering Fama and French (2015) regression instead of a simple market model such as single-factor capital asset pricing model is that the four common risk factors control for the effect of searches made by investors in the regression (when Google search volume is included in the regression at the same time) as common risk factors determine the variation in the expectation of stock market investors (See Fama and French 2015 p. 3). People with depression and anxiety caused by other factors other than stock market related factors may also seek information on medication and diagnosis for depression and anxiety. To control for the effect of searches made by people with depression and anxiety caused by other factors such as unemployment, US monthly unemployment rate (UER) is controlled for in the regression. Unemployment rate generally rises or falls in the wake of changing economic conditions. This also controls for the effect of searches made by households who are not in the labour force[1]. In addition, searches made by people with depression and anxiety caused by domestic affairs (e.g. household consumption pressure) must also be controlled for in the regression. Monthly US inflation rate (IFR) is introduced into the regression equation 2 to control for such effect.

Several papers demonstrate that depression and anxiety is more pervasive in the case of crisis situations (Ng et al., 2013). In particular, Frasquilho et. al., (2015) review the existing literature pertaining to possible association between economic recessions and mental health outcomes and find that the economic recession impacts many aspects of mental health such as substance disorder and ultimately the suicidal behaviour. On the other hand, scholars have shown that the behaviour of investors changes significantly during economic and financial crisis periods (See e.g. Hoffmann et. al., 2013; Zouaoui et.

[1] Note that the most appropriate proxy for this is the labour force participation. However, it was dropped from the regression since it suffered from severe multicollinearity problem (correlated with unemployment rate and inflation rate) during the assessment of descriptive statistics.

al., 2011).

Subprime mortgage crisis was the largest crisis that entire population of United States was affected and contributed to a period of turmoil in financial markets. Although the crisis was gradually rooted in the construction industry (mainly residential) with bursting of the United States housing bubble during 2005–2006 (i.e. within the sampling period), a significant decline in housing prices was occurred during the first quarter of 2008 to late 2011 after mortgage delinquencies and devaluation of housing-related securities. Household debt has increased drastically due to triggering mortgage of properties and resulted in unbearable financial burden on families. The reductions in household spending and business investments negatively impacted the main economic indicators such as growth and production of the United States.

Arditi et al. (2015) find that investors tend to search extensively following negative stock returns. In order to understand whether the association between depression and anxiety, and stock market investment is more pervasive when investors gain in the current period after making losses or when investors lose in the current period after making profits (i.e. gains) in the previous period, two dummy variables are used. The dummy variable $D^{losses\ to\ gains}$ takes the value 1 for the observations when stock market index change is positive in the current period and negative in the previous period (i.e. month). Conversely, the $D^{gains\ to\ losses}$ takes the value 1 for the observations when stock market index change is negative in the current period and positive in the previous period. Qin et. al., (2019) show that the investors are affected by anxiety not only in crisis market but also in the bull market. Two other dummy variables are included to capture the significance of the association between depression and anxiety, and stock investment during bullish and neutral market conditions. Dummy variable D^{up} takes the value 1 when US market return (US market return not the risk premium) is greater than zero (i.e. positive) or zero otherwise. Also, dummy variable $D^{neutral}$ takes the value 1 when the US market return is less than or equal to risk free rate of the United States as proxied by Treasury bill rate (TB). Practically, risk free or very low-risk investments such as treasury bills are not subject to significant fluctuations. As such, TB rate is taken as the benchmark for risk-free rate.

$$RP_t = \phi + \psi_1 SMB_t + \psi_2 HML_t + \psi_3 RMW_t + \psi_4 CMA_t + \psi_5 IFR_t + \psi_6 UER_t + \lambda GSV_t$$
$$* D_t^{losses-to-ga} + \eta GSV_t * D_t^{gains-to-losses} + \delta GSV_t * D_t^{up} +$$
$$\propto GSV_t * D_t^{neutral} + \varepsilon_t \quad (3)$$

If the association between depression and anxiety, and stock market investments (i.e. return) is more pervasive when investors recover (or gain) from past periods' losses or when investors lose (in the current period) the profits earned in the past (previous periods), the coefficients λ or η (respectively) should be positive and statistically significant[2]. Conversely, if the market gives a higher return in a neutral market, depression and anxiety must reduce (practically) and if the investor return reduces below the risk free rate, the depression and anxiety must increase because they forgo the

[2] It is assumed that the profits are not withdrawn from stock market investments. Rather, they are reinvested (i.e. traded).

opportunity to invest in bond or bill market (i.e. due to pressure or stress from the opportunity lost). This is particularly because the investors have to pay the lenders, if they have borrowed and invested, even without earning a return over the risk-free rate. As such, the coefficient $\propto$ should be negative and statistically significant. In above equation, GSV is excluded to ensure that the regression does not suffer from dummy variable trap due to multicollinearity between GSV and the dummy variables (such exclusion does not have any impact on the regression outcome as four other dummy variables are more fully explained). The coefficient δ should be statistically significant and positive if the investors' exposure to depression and anxiety is more pronounced during up-trending or bullish market conditions.

Data pertaining to stock returns including cross-sectional returns on common risk factors were obtained from Kenneth R. French data library (available at https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). Economic data are obtained from the Federal Reserve Bank of St. Louis webpage (available at https://fred.stlouisfed.org/). Google search query data were generated from Google Trend webpage (https://trends.google.com). When the related terms for the diagnosis of depression and anxiety is typed on the Google trend search bar, it suggests most 25 closely related search terms trending on Google. Fifty (50) search queries were generated from Google trend on closely related terms from January 2004 to August 2019 on a monthly basis. Google scales the resulting search queries on a range of 0 to 100 based on topics proportion to all searches by Google. Since there is an option to generate search query data by country, queries or search traffic data from United States were easily generated (See Table 1).

Table.1.Search Terms on Depression and Anxiety

1	anxiety and depression: (United States)	26	how to get out of depression: (United States)
2	anxiety depression medication: (United States)	27	how to get rid of anxiety and depression: (United States)
3	anxiety medication: (United States)	28	how to get rid of anxiety: (United States)
4	best anxiety medication: (United States)	29	how to get rid of depression alone: (United States)
5	best depression medication: (United States)	30	how to get rid of depression fast: (United States)
6	best medication for anxiety and depression: (United States)	31	how to get rid of depression on your own: (United States)
7	best medication for anxiety: (United States)	32	how to get rid of depression without medication: (United States)
8	best medication for depression: (United States)	33	how to get rid of depression without medicine: (United States)
9	cure for depression: (United States)	34	how to get rid of depression without meds: (United States)
10	depression and anxiety medication: (United States)	35	how to overcome depression: (United States)
11	depression medication side effects: (United States)	36	how to treat anxiety and depression: (United States)
12	depression medications: (United States)	37	how to treat anxiety: (United States)
13	depression symptoms: (United States)	38	how to treat depression at home: (United States)
14	depression test: (United States)	39	how to treat depression without drugs: (United States)

15	depression treatment: (United States)	40	how to treat depression without medication: (United States)
16	how to beat depression: (United States)	41	medication for anxiety and depression: (United States)
17	how to cure anxiety: (United States)	42	medication for anxiety: (United States)
18	how to cure depression and anxiety naturally: (United States)	43	medications for depression: (United States)
19	how to cure depression and anxiety: (United States)	44	natural ways to treat depression: (United States)
20	how to cure depression by yourself: (United States)	45	signs of depression: (United States)
21	how to cure depression naturally: (United States)	46	symptoms of depression: (United States)
22	how to cure depression without medication: (United States)	47	treatment for depression: (United States)
23	how to cure depression: (United States)	48	ways to treat depression: (United States)
24	how to deal with depression: (United States)	49	what causes depression: (United States)
25	how to fix depression: (United States)	50	what is depression: (United States)

Source: Author's own elaboration

3. Results & Discussion

Table 2 outlines the descriptive statistics of the regression variables. Except for common risk factor SMB, RMW and CMA, other regression variables including economic variables are non-normally distributed as JB test statistic exceeds its critical value of 5.99. All dummy variables are highly non-normal as the observations are briary numbers. Except for Google trend and unemployment rate data, all other variables are highly stationary as ADF test statistic falls below the critical value of -2.87. Also, all regression variables are serially uncorrelated except for Google trend and economic variables as Ljung-Box Q statistic for serial correlation up to 36 lags does not exceed its critical value of 50.99. Obviously, statistical properties such as normality cannot be expected in dummy variables. Equity risk premium and risk factor HML are highly non-normal. These observations are common in financial time series data as security price changes are expected to be non-normal due to price clustering (Fama 1970). Fama and French (2015) regression could more preciously capture this phenomenon in asset pricing. . It is usual that dummy variables cannot obey the statistical criteria of a regression variable but they are accompanied by qualified regression variables.

Table.2. Descriptive Statistics of Sample Data

Description	Mean	Med.	Max.	Min.	JB	ADF	Q(36)
RP	6.9E-03	1.1E-02	0.114	-0.172	45.234	-12.614	48.360
SMB	5.4E-04	6.5E-04	0.068	-0.048	2.957	-15.318	31.752
HML	-9.9E-04	-2.4E-03	0.0829	-0.112	47.656	-10.675	44.345
RMW	2.8E-03	2.5E-03	0.051	-0.040	3.170	-11.549	34.860
CMA	-4.4E-04	-8.5E-04	0.037	-0.033	3.380	-12.345	45.350
GSV	36.192	38.080	57.060	15.800	9.750	-0.306	3412
INFR	2.080	2.160	2.710	0.250	119.51	-3.786	742.93
UER	6.124	5.400	10.000	3.600	20.81	-1.590	2873.2
$D^{losses-to-gains}$	0.2139	0.000	1.000	0.000	60.70	-17.96	39.75
$D^{gains-to-losses}$	0.2180	0.000	1.000	0.000	58.55	-17.93	49.11

D^{up}	0.670	1.000	1.000	0.000	33.49	-12.97	22.65
$D^{neutral}$	0.346	0.000	1.000	0.000	32.72	-13.00	18.19

Notes:

1. JB is the Jarque–Bera test statistic for normality. Under null hypothesis for normality, critical value of $\chi 2$ (2) distribution at 5% significance level is 5.99

2. ADF is the Augmented Dickey–Fuller test statistic for stationarity of data for maximum 12 lags. Under null hypothesis for data having a unit root, the critical value at 5% significance level is -2.89 (MacKinnon (1996) one-sided p-values).

3. Q (20) is the Ljung-Box Q statistic for serial correlation upto 36 lags. Under the null hypothesis for no serial correlation in data, the critical value of $\chi 2$ (36) distribution at 5% significance level is 50.99.

Source: Author's own elaboration

Risk factor coefficients of SMB and HML are positive and highly significant (p<0.01, p<0.05) in explaining the US equity risk premium of all three regressions. Surprisingly, the risk factors RMW and CMA are negative and statistically significant ((p<0.0, p<0.05) in regression 1, 2, and 3. When the proxy variable GSV is introduced into the equation (1) as in equation (2), the significance of coefficients of risk factors improved and the GSV becomes positive and highly statistically significant (p<0.01). As such, depression and anxiety is significantly and positively associated with the expectation of stock market investors (i.e. stock market investments). As per the results of regression equation (3), the coefficients of losses-to-gains dummy and up dummy variables are highly significant and positive (p<0.01). However, the coefficient of gains-to-losses dummy is not statistically significant (p>0.10). More importantly, the coefficient of neutral dummy is negative and statistically significant as hypothesized (p<0.10). Although the unemployment rate significantly (p<0.10, p<0.01) explains the stock return in equation 2 and 3, the coefficient of inflation rate becomes statistically insignificant (p>0.10).

The goodness of fit is 30%, 34% and 66%v for the three regressions respectively. The Durbin-Watson statistic which measures the degree of autocorrelation in residues is 1.981, 2.078 and 1.878 for the regressions 1, 2 and 3 respectively. Akaike information criterion (AIC) which assists identifying the relative quality of the regressions 1, 2 and 3 are -3.888, -3.914 and -4.541 respectively.

Table.3. Regression Results

Variable	Equation								
	01			02			03		
	Coef.	t-stat	VIF	Coef.	t-stat	VIF	Coef.	t-stat	VIF
SMB	0.424***	3.304	1.142	0.448***	3.499	1.236	0.208**	2.393	1.356
HML	0.365**	2.114	1.669	0.377**	2.358	2.188	0.287***	3.304	1.499
RMV	-0.788***	-3.336	1.388	-0.712***	-3.408	1.297	-0.308**	-2.318	1.333
CMA	-0.641***	-2.636	1.831	-0.691***	-3.005	2.031	-0.447***	-2.970	1.380
GSV		NA		7.5E-04***	2.921	1.974		NA	
INFR		NA		9.5E-03	1.360	2.332	6.0E-03	1.214	1.238
UER		NA		2.2E-03*	1.714	1.140	2.6E-03***	2.748	1.059
$D^{losses-to-gains}$		NA			NA		4.2E-04***	3.363	1.174
$D^{gains-to-losses}$		NA			NA		8.3E-04	0.128	2.247
D^{up}		NA			NA		7.9E-04***	4.268	4.145
$D^{neutral}$		NA			NA		-5.2E-04**	-2.171	5.544
R^2		30%			34%			66%	
DW		1.981			2.078			1.878	
p AIC		-3.888			-3.914			-4.541	

Note: ***Statistically significant at 1%. **Statistically significant at 5%. *Statistically significant at 10%. The coefficients are estimated using Newey and West 1987 procedures for the estimate of regression coefficients on the robust standard errors for consistent heteroskedasticity and autocorrelation. $R2$ is the measure of Goodness-of-fit from the regressions specified above. DW is the Durbin-Watson statistic for autocorrelation in residues from the respective regression. AIC is the Akaike information criterion for assessing the relative quality of statistical models described above for the given dataset. VIF is the variance inflation factors of the respective coefficients.

Source: Author's own elaboration

A significant and positive coefficient of SMB in all three regressions indicates that the small firms outperform large ones. This is quite obvious as large firms are exposed to various types of risks than small firms and equity holders often require stable return commensurate with the size of investment. On the other hand, value stocks outperform the growth stocks as hypothesized by Fama and French (2015) because the coefficient of HML is positive and statistically significant. As such, value stocks have outperformed growth stocks on average while small firms have outperformed larger ones during the sampling period. The significant and negative coefficient of RMW suggests that firms with weak profitability have produced exceptional performance than firms with robust profitability during the sampling period (all three regressions). There are a number of reasons for this observation. Heavy investment despite low profitability may result in investment in these stocks by investors although the operating results of firms may be yet to realize or disclose. Significant macro and microeconomic fluctuations also cause low profitability firms to gain momentum in the hope of future prospects in profitable operations. The negative and significant coefficient of CMA indicates that the aggressive investment firms outperform conservative investment firms. The negative and significant coefficients of RMW and CMA can be meaningfully explained for the period as value stocks tend to be less profitable and the expected profitability is larger for aggressive investment firms that invest a lot despite low profitability. In regression 2 and 3, the coefficient applicable to unemployment is positive and statistically significant which is well in line with the previous findings of Gonzalo and Taamouti (2017) and Boyd et. al., (2005). Usually, increased unemployment forces the Federal government to reduce the interest rate which in turn increases the stock market prices. Stock trading is subject to

risk and uncertainty and higher level depression stimulates higher level of expected utility from risk taking (Costello 1983). The results of regression 2 show that GSV is significantly and positively associated with stock market return which suggests that depression and anxiety provides incentives for stock market investments. Studies show that depression and anxiety enhances the performance (von Helversen et al., 2011). Von Hecker et al., (2013) find that tasks requiring mental judgment (especially information based judgment) are significantly associated with depression. The above finding provides support (deductively) for the empirical findings of Qin et al., (2019) that stock market turbulence significantly increases the anxiety of investors. It is also in line the observations of Lin et al., (2014). From daily incidences of mental disorders in Taiwan from 1998 through 2009, they find that stock market trading and investments increase hospitalizations due to mental disorders. The coefficient of losses-to-gains dummy is positive and statistically significant. This clearly suggests that the depression and anxiety is significantly associated with the stock market investments when investors recover (gain) in the current period after making losses in the previous periods than losing after making profits in the previous periods. This is particularly because investors feel anxious about sudden reversal of previously earned gains in the current period. McInerney et al., (2013) find that sudden wealth losses cause immediate decline in subjective measures of mental health such as feeling of depression. It is also in line with the argument that investors hold a negative view of the future that might impact the amount of rewards to be received from future investments (Pulcu et al., 2014). On the other hand, depressive conditions stimulate people to accept and defeat in competitive situations[3] (Kupferberg 2016).

However, the results suggest that there is no significant association between depression and anxiety and stock market investments when investors lose in current period after gaining in the previous period because the coefficient applicable to gains-to-losses dummy crisis not statistically significant. Investors usually do not regret for making bearable losses after making significant gains. The exposure of investors to depression and anxiety is more pronounced during up-markets (or up-trending market) as coefficient δ is highly significant and positive ($p<0.01$). These results are in line with the findings of Qin et. al., (2019) that the investors' exposure to stock market had a significant positive association with anxiety disorder during bull market period. On the other hand, the depression and anxiety reduces when the investors' return increases in a neutral market and it increases when the investors' return is less than or equals to the risk-free rate of the United Sates because it adds an additional stress either to withdraw the investment at a loss or increase return above risk-free rate to ensure a sufficient return on investment. (i.e. due to pressure or stress from the opportunity lost. In such case, the investors' return is less than the risk free rate). The coefficient α is negative and highly statistically significant that confirms the above relationship. It is worth noting the fact that the inclusion of dummy variables improved the explanatory power of the model significantly from 34% to 66% indicting that the depression and anxiety is significant in explaining stock market returns under extreme market conditions.

The regression variables explain about 30%, 34% and 66% of the variation in the dependent variable (equation 1, 2 and 3) which is very reasonable when compared with the findings of past research in this section of economics (Lee 2016). Errors from the regression are serially uncorrelated as DW test statistic is around 2 in all three regressions. The relative quality of the statistical models as measured by AIC is acceptable. The regression variables (explanatory variables) are not subject to multicollinearity as VIF factors are well within the generally accepted rule of thumb of 4

[3] Such as stock trading (investment) game.

in all three regressions.

These findings have significant implications for policymaking in the financial services industry. Unless properly addressed, by making available investor education and counseling programs, depression and anxiety among investors may lead to severe economic consequences. It may also lead to serious unhealthy and risky coping strategies to be dealt, with regard to investment decisions in bull markets following market crises. The persistent depression and anxiety could induce investors to alcohol addiction or even suicide attempts (Bartels 2002). Moreover, the authorities entrusted with the responsibility of investor education and counseling must understand the best time (best market condition for example bull, bear or crisis market conditions) to promote their programs because the extent of stock market exposure to depression and anxiety differs greatly between declining to rising, bull and neutral market conditions.

The investors who search for identification and medication for depression and anxiety by other modes of search are disregarded in this study, which may sometimes alter the reported results. Also, Google trend does not capture the geographical areas where there is no or little access to internet (Kennedy 2013). The volume of search queries are subject to seasonality effect of the health issue on search, which is not captured by the search engines (Ayers et al., 2013). It should be noted that search queries processed by other search engines such as Bing, Yahoo, Ask.com, AOL.com are not factored into the estimation, which may also impact the research outcome. However, as of July 2019, Yahoo had a search market share of 11.5 percent whereas Google dominated with 62.5 percent of all core search queries in the United States (Clement 2019).

5. Conclusion & Recommendations

The findings of this study reveal that the depression and anxiety is significantly and positively associated with stock market investments when the stock market prices are escalating. However, the depression and anxiety reduces when the investors' return increases in a neutral market and it increases when the investors' return is less than or equals to the risk-free rate. It also reveals that the investors feel anxious about sudden reversal of gains earned in the current period after making losses in the previous period.

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