

Infectious Diseases, Stock Market Volatility, and Public Opinion on Home Buying in the United States: Implications from COVID-19 and Beyond

Christopher Olds

Department of Political Science,
Fort Hays State University, United States;

ABSTRACT

The study evaluates whether there are limits to an excess in consumptive behaviors during periods where infectious disease outbreaks produce unpredictable changes in equity markets. While there is evidence of panic buying in these periods such that people increasingly acquire goods that they do not actually need, this does not mean that people will acquire items if their purchase has significant risk tied to them. Using time series information across 35 years, the empirical analyses show that people are less likely to think buying a home is a good idea due to change in the level of equity market volatility brought about by infectious diseases. Even though panic buying occurs during epidemics and pandemics, this is not an indication that decision-making about purchases is wholly irrational. In uncertain times when infectious disease outbreaks make equity markets unpredictable, people rationally seek to minimize the level of personal losses they experience as much as possible.

Keywords: Infectious Diseases, Panic Buying, Home Buying, Equity Markets, Epidemics, Pandemics, COVID-19, Uncertainty, Risk, Public Opinion, Interdisciplinary Social Science.

INTRODUCTION

A significant amount of discussion following the arrival of the COVID-19 pandemic involves panic buying behavior [1]. Panic buying occurs when people perceive a limited supply of goods is on the horizon (a supply disruption), so they will accumulate extra units of goods for potential consumption into the extended future [2]. An increase in consumer panic buying increases the level of demand for products perceived to be essential for survival; the demand is so high that it is difficult for businesses selling goods to satisfy consumption levels [3]. If individuals perceive an interruption in the supply chain of goods is going to occur, they will engage in more buying to avoid feeling insecure and unsure of when goods will be available again [4]. When people feel insecure about their safety, they feel compelled to acquire goods and hoard them under the belief this increases the likelihood of survival [5]. The acquisition of goods instills a sense in people that they have more control over their security [6]. There is then significant historical evidence of a surge in panic-induced buying of products in epidemic and pandemic periods [7]. Does all of this suggest that individuals equate the acquisition of all things associated with safety as necessary during pandemic periods?

Using information collected from January 1985 to May 2020, the current study evaluates whether periods where there are infectious disease outbreaks that bring about volatility in equity markets are points in time where people express more skepticism that purchasing a home is a good idea. Evaluating this is necessary to evaluate the boundaries of consumptive behavior. While people are more likely to acquire items they do not need during epidemics or pandemics, this in and of itself does not mean people are entirely irrational in their reasoning about purchases. For those purchases where there is significant risk involved (e.g. home buying), people can exhibit rational decision-making behavior and express reluctance in making these kinds of purchases.

LITERATURE REVIEW

With infectious disease outbreaks, we see an increase in the level of posttraumatic symptoms like severe anxiety, instability, guilt, hostility, and loneliness, such that there are deleterious effects on mental health during these periods [8]. When infectious diseases spread, people are torn between their wish to preserve their regular routines and the uncertainty over how long it will be before they can return to these routines [9]. A potential means to cope with this conflict is to acquire as many goods as possible to produce the sense that one has regained control over their safety and security in uncertain times. When facing a crisis situation like an epidemic or a pandemic, people are going to adopt behaviors perceived as necessary for survival, even if those behaviors might be primitive instinctual behaviors that are not rooted in a rational decision calculus [10]. Research in survival psychology says people will exhibit changes in their behavior following outbreaks or natural disasters [11]. One of these behavioral changes is panic buying, whereby people purchase a significant amount of goods before, during, and after one of these perceivably threatening events happen [12].

Panic buying then is a response during epidemics and pandemics that is rooted in fears of threatened survival [13]. There are various stimuli or information cues people can be exposed to where these fears can be activated. For example, the proliferation of social media where people can express their fears and write about their response to those fears for others to see can create almost a contagious conformity, such that people feel the need to respond to events in a similar way as others have [14]. Traditional mass media outlets can also influence panic buying levels; stories that others are buying and depleting the level of available goods will lead people to emulate this behavior if they believe it will increase their chances of survival [15].

The response of government to an event can create a lack of faith that government will be able to provide proper assistance if resources are depleted. People decide it is best to take matters into their own hands and acquire as many goods as possible because there is no confidence that government actors will be able to help in a timely basis [16].

Regardless of the specific cause that results in panic buying, it is quickly apparent that this is a type of herd behavior where many people simultaneously are trying to acquire goods (food, beverages, toiletries, medical products, etc.) that deplete the available stock, resulting in those who have a genuine day-to-day need for these products to not have a means of acquiring them [17]. Avoiding supply disruptions during infectious disease outbreaks thus becomes a major priority but preventing them is hard to avoid with persistent panic buying. Persistent panic buying is a consequence of the negative psychological symptoms experienced during infectious disease outbreaks. There will be many instances of negative psychological symptoms exhibited in

individuals that did not previously have mental health conditions, as well as the worsening of negative psychological symptoms for those that have already been diagnosed with a mental illness [18]. While negative psychological symptoms lead people to engage in panic buying behavior that is often more instinctual than a careful and calculated evaluation of benefits relative to costs, we have to consider whether consumption decisions during times of infectious disease outbreaks are consistently devoid of an analysis of benefits relative to costs.

Epidemics and pandemics are periods of high uncertainty. Usually when individuals face uncertainty in their contextual circumstances they will seek to minimize the potential losses as much as possible [19]. Attempting to reduce perceived risk will be the expected reaction from a public lacking confidence in the current and foreseeable composition of the economy. When tasked with deciding under conditions of uncertainty, people will attempt to determine how desirable possible outcomes are in conjunction with how likely those outcomes are to occur [20]. If there is high uncertainty about the existing economic climate and future economic prospects, people will express reticence to take actions that are of significant risk.

An example of such an action is the purchase of a home. Periods where infectious disease outbreaks occur can create interruptions in employment, as has been seen during the COVID-19 pandemic with stay-at-home orders and closures of specific sectors of business to mitigate the spread of infections. Aspects such as these reduce the level of labor available to conduct normal business, which produces sharp declines in the production and output of goods and services, exacerbating already present concerns about disruptions to the supply chain that help to increase the amount of uncertainty about economic conditions [21].

With interruptions in employment there will also be uncertainty regarding earnings, a variable which has been found to be a significant determinant of whether home ownership will occur [22]. If infectious disease outbreaks spawn social distancing guidelines, this can reduce the ability of real estate agents to offer viewings of properties. Physically being able to see/tour prospective homes is deemed a crucial part of the real estate selling process [23]. If prospective home buyers cannot even physically see homes available on the market in-person and must rely on digital tours over tools like Facetime or Zoom, there will be uncertainty that any home viewed is a suitable or proper fit for the needs and/or preferences of buyers. Buying a home is a resource-intensive process outside of periods where there are infectious disease outbreaks [24]; the presence of an epidemic or pandemic might only exacerbate the amount of time, effort, and money expended in searching for a home to acquire.

The considerations mentioned in the prior paragraph make the potential risks involved in home buying during infectious disease outbreak periods markedly higher than purchasing an excessive number of toilet paper rolls and containers of liquid hand soap. Prospective home buyers will be particularly skittish at taking on a mortgage if infectious disease outbreaks increase equity market volatility; higher equity market volatility leads people to believe the current and prospective economic climate is unclear [25]. With a lack of clarity about the economic context for the foreseeable future due to infectious disease outbreaks that result in equity market volatility, people will come to the judgment that conditions are not ideal to buy a home.

RESEARCH HYPOTHESIS AND METHODOLOGY

Empirical Prediction

A major focus of the literature on infectious disease outbreaks is tied to panic buying, with the implication that fear produces irrational purchasing decisions of goods that people do not necessarily need or will use. This ignores the possibility that rational decision-making rooted in a careful review of economic conditions brought about by infectious disease outbreaks can still occur. With the extensive resources needed to complete the home buying process, an unclear forecast of the economy brought about by an infectious disease outbreak will lead individuals to be reticent about buying a home. The empirically testable hypothesis explored in this project about the relationship between economic conditions in infectious disease outbreak periods and home buying preferences is as follows: prior change in the level of infectious disease equity market volatility positively predicts an increase in the level of the public that believes it is not a good period in which to purchase a home.

Measurement of Concepts

The empirical hypothesis of this project is making a prediction about the relationship of concepts across time: change over time in infectious disease equity market volatility is going to bring about a change in public opinion about home buying conditions. The collection of information for the project then must allow for analytical procedures to be performed that can contrast the dynamics (shifts) in these concepts across time.

To measure the concept of infectious disease equity market volatility, data made publicly available by Baker et al. [26] is collected. The measure is calculated by first gauging the overall level of equity market volatility, regardless of whether there is a pandemic. To find this, the amount of articles in eleven major U.S. newspapers that use terms about the economy (e.g. 'financial,' 'economy,' 'economic'), equity markets (e.g. 'equity,' 'equities,' 'stock market,' 'Standard and Poors'), and the presence of volatility in the market (e.g. 'uncertain,' 'uncertainty,' 'volatile,' 'volatility,' 'risky,' and 'risk') is tabulated. The general measure of equity market volatility is then scaled such that the time series matches the mean value of the Chicago Board Options Exchanges (CBOE) Index, which is more commonly known as the VIX. The VIX takes market data in real time to gauge what are expectations about market volatility over the following 30 days. The dynamics of the general equity market volatility measure collected by an automated text search of mass media coverage and the VIX move together across time in a similar way, a sign that the general equity market volatility indicator is an appropriate representation of equity market volatility.

With information on general equity market volatility in place, a specific search of articles using the same terms as the general equity market volatility indicator while also mentioning infectious diseases is performed. In other words, newspaper stories that use terms about the economy, equity markets, volatility, and infectious diseases (e.g. 'flu,' 'disease,' 'epidemic,' 'virus,' 'pandemic,' 'H1N1,' 'Ebola,' 'SARS,' 'MERS,' 'H5N1,' and 'coronavirus') are collected. This is the barometer of infectious disease equity market volatility. To find the score of this measure over time, the fraction of general equity market volatility articles that contain one of the infectious disease terms is multiplied by the overall total number of general equity market volatility articles. The number of articles on equity market volatility that tie the occurrence of this volatility to infectious diseases is essentially contrasted with the grand total of news articles discussing equity market volatility. Although the measure is calculated and updated daily by the group of scholars that created it, the other measures

in the project are available as monthly indicators up until May 2020 at the time of dataset collection. As a result, the monthly average score of the infectious disease equity market volatility indicator is used in this current project. While the creators of the infectious disease equity market volatility measure find that COVID-19 is the only infectious disease outbreak in over a century to lead to significant and persistent volatility in the stock market, that does not mean that equity market volatility tied to infectious diseases has no salient economic consequences. The current project seeks to explore the effect of infectious disease equity market volatility on one prominent economic factor, the level of willingness within the general public of the United States to say that conditions are not conducive to home buying.

The information on public opinion about home buying in the U.S. comes from the Survey of Consumers at the University of Michigan. Each month a minimum of 500 telephone interviews are performed with a representative sample of residents from the contiguous United States. Each respondent is asked a battery of questions about their economic attitudes and expectations [27]. The specific question from the survey used in this study about home buying attitudes is asked as follows: 'Generally speaking, do you think now is a good time or a bad time to buy a house?' The percentage of respondents that say it is a bad time to buy a house is the representation of home buying skepticism used in the empirical analyses of this project.

The University of Michigan's audit of the Survey of Consumers finds that change in responses for home buying preferences captured in the above question precedes actual change in home sales six months before they occur. The question then helps to gauge consumer buying attitudes with accuracy; when people say it is a good time to buy a house the number of new and existing single family homes sold increases, while the number sold decreases when people are less likely to say it is a good time to buy a house. The last month in which information is publicly available at the time of dataset construction on this measure is May 2020. The analysis for this project then runs through January 1985 to May 2020, the timespan in which information on all variables of interest is available at the time of data analyses performed for the project (July 2020).

To flesh out the analysis and account for another indicator that can potentially shape views of the economy, the geopolitical risk index is included in the study [28]. Geopolitics involves efforts by countries and organizations to compete for and control portions of land. Geopolitical risk involves the amount of disagreements, threats, military actions, and terrorist attacks involving either countries or organizations pertaining to disputes over portions of land. Growth in the geopolitical risk index has been found to stifle growth in equity markets, decrease employment levels, and deflate consumer confidence. Business sectors in industries that operate in multiple countries are exposed to geopolitical risk which leads these industries to receive lower levels of investment. Findings of this nature are justification for incorporating the geopolitical risk index into the analysis; a surge in geopolitical risk can potentially introduce uncertainty into the economic environment that leads more people being disinclined to buy a home.

The procedure to calculate the geopolitical risk index is similar to what is done to gauge infectious disease equity market volatility. Automated text searches of a digital repository of newspaper articles from eleven widely circulated publications are performed to measure the monthly number of news articles using terms relevant to geopolitical risk. Terms involving geopolitical risk include 'military operation,' 'threat of war,' 'terrorist risk,' and 'nuclear conflict.' Articles including terms

like these are then divided by the total number of articles published by all eleven newspapers for each month of the benchmark geopolitical risk index.

In addition to the geopolitical risk index, several exogenous control variables are accounted for. These exogenous factors can happen regardless of the level of infectious disease equity market volatility, public sentiment on home buying, or the extent of geopolitical risk in the world. All the exogenous control variables can potentially influence the observed levels seen when reviewing the aforementioned variables/concepts. The first control variable accounts for major geopolitical events that can heighten geopolitical risk. The variable is coded as a “1” in those months where there is an event that brings about a significant spike in the geopolitical risk index relative to prior months. All other months are coded as a “0.” The events and the months in which they occur are as follows: U.S. bombing of Libya/Operation El Dorado Canyon (April 1986), Operation Desert Storm is launched with air attack on Iraq and Kuwait (January 1991), the September 11th terrorist attacks (September 2001), the dispute at the United Nations regarding Iraq compliance with weapons inspections (January 2003), an audiotape attributed to Osama bin Laden encourages Muslims to take aggressive actions against the United States (February 2003), the invasion by Iraq by a U.S.-led coalition of countries (March 2003), and the Baghdad International Airport airstrike on Qasem Soleimani (January 2020).

Infectious major disease events are the second exogenous control variable. The indicator measures the start of major infectious disease outbreaks reported by global health authorities like the World Health Organization that result in at least 5,000 deaths. A month in which an infectious disease outbreak begins to receive attention by multiple global health authorities through public announcements and press releases is scored as a “1,” while those months without any such announcements or releases are scored as a “0.” The major infectious disease outbreaks included in the control variable are the Nigerian Yellow Fever (December 1986), the Bangladesh cholera epidemic (September 1991), the West Africa meningitis epidemic (February 1996), the Swine Flu pandemic (April 2009), the Cholera in Haiti outbreak (October 2010), the Western Africa Ebola virus epidemic (March 2014), the 2017-2018 U.S. flu season (October 2017), the Democratic Republic of Congo measles outbreak (June 2019), and the Wuhan Municipal Health Commission announces cases of ‘viral pneumonia’ in the People’s Republic of China (December 2019). The latter event serves as an indicator of the start of the COVID-19/coronavirus pandemic.

The third control variable is an indicator of recession periods in the United States based on determinations of the National Bureau of Economic Research. Any month that the NBER identifies as being a part of a recession period is coded as a “1,” while any month not identified as a part of a recession period is coded as a “0.” The following periods are coded as a part of a recession: July 1990 to March 1991, March 2001 to November 2001, December 2007 to June 2009, and February 2020 to the last month measured in the dataset, May 2020.

Procedures for Analyzing Dataset

As has already been mentioned, the values of the variables of interest change across time, and there is also the possibility that variables mutually influence each other. These aspects make vector autoregression and moving average representation useful techniques to analyze the dataset constructed for the project.

Vector autoregression makes it possible to assess whether prior change in one variable measured in the system (meaning the collection of dynamic variables) can predict change in another variable in the system [29]. With vector autoregression, all variables in the system are treated as endogenous variables whereby each variable in the system is regressed on prior values of itself and prior values of the other variables within the system. When prior values of one variable can predict current values of another variable, that provides some evidence of a possible causal relationship between the variables, while still accounting for the possibility of a multidirectional relationship between the variables.

Vector autoregression accounts for history by using prior values (also known as lags) for each variable in the system. Including prior values of variables helps to address the potential inertial qualities of each variable, meaning that prior values of a specific single variable can often serve as a reliable predictor of current values for that same variable [30].

Whenever a standard vector autoregression is performed, a series of F-tests are conducted. The Granger causality tests assess the restriction that all the prior values of one variable do not significantly enter into the regression of a particular endogenous variable that is specified within the system of variables [31]. Those instances where a block of coefficients for a variable is statistically significant indicates that a Granger-causal relationship is present between that particular variable and the specified endogenous variable within the system.

Although vector autoregression sheds light on potential causal relationships between time series variables, the usage of prior values in the vector autoregression system introduces concerns that coefficient estimates are plagued with multicollinearity issues, which necessitates the usage of another technique to examine the polarity (meaning positive or negative direction) and magnitude (meaning size) of dynamic relationships.

Using a moving average representation procedure allows for an examination of the polarity and magnitude of dynamic relationships. Moving average representation procedures perform a simulated shock (meaning change) on a specified variable in the system. The response of other variables to that shock is observed over a period of time. Moving average representation essentially performs simulations to evaluate the response other variables have after a specific variable is shocked (changed). The response to the change is visualized on a graphic plot, and confidence intervals for the predicted response of a variable following a shock to another variable in the system can be obtained through Monte Carlo integration and the fractile method [32].

To make sure there is a uniform interpretation of variables to clarify the magnitude of change following a simulated shock, the variables in the system are all standardized. A group of standardized variables is rescaled so that they all have a mean of zero and a standard deviation of one. This allows for the review of how large a standard deviation change a variable will exhibit across time following a one standard deviation increase to another variable within the system.

To proceed with standard vector autoregression and moving average representation techniques it is necessary to determine whether the variables that are a part of the system are stationary. Stationary variables have statistical properties that are constant over time, which means there is no evidence that any of them display a deterministic trend. A deterministic trend makes any findings

regarding a statistically significant relationship between dynamic variables dubious. Based on the diagnostic tests presented in Table 1 there is no evidence to suggest that infectious disease equity market volatility, opinions on home buying, or the geopolitical risk index possess a deterministic trend. With these findings in hand, it appears that standard vector autoregression and moving average representation procedures can be performed.

Table 1. Augmented Dickey-Fuller t-tests for Presence of Unit Roots

Variable Name	Geopolitical Risk Index	Infectious Disease Equity Market Volatility	Home Buying Opinion
Test Statistic	-7.80*	-4.75*	-3.54*
Critical value .01	-3.44	-3.44	-3.44
Critical value .05	-2.87	-2.87	-2.87
Critical value .10	-2.57	-2.57	-2.57
Number of Lags	0	0	1

Note: Number of lags determined by Bayesian Information Criteria

For the test statistics of all variables at all critical values, the null hypothesis of a unit root present in the variable can be rejected. All variables in the system are stationary, such that standard vector autoregression and moving average representation techniques can be applied.

RESEARCH FINDINGS

The results of the time series analyses provide support for the research hypothesis that prior change in infectious disease equity market volatility significantly predicts an increase in current levels of public skepticism about home buying. While the existing literature has focused on epidemics and outbreaks increasing the level of panic buying, a form of consumptive behavior that is considered more primitive and instinctual than thoughtful decision-making, the results seen in this project demonstrate that unpredictability in equity markets that are tied to infectious disease outbreaks lead people to be uncertain about economic conditions. The uncertainty about the composition and health of the economy makes people risk averse with a purchase like home buying where there is already considerable risk and resources involved in the process when infectious disease outbreaks are not occurring.

The project's findings lend some support to the perspective that epidemic and pandemic periods do not lead to entirely irrational decision-making regarding purchases. Epidemics and pandemics that create disruptions in the equity market compel members of the public to express the logical viewpoint that the economic risks of home buying are too substantial to overlook. Uncertainty brought about by infectious disease equity market volatility leads people to lack confidence in the current and future economic climate, such that they will be cautious to take any actions with significant risk tied to them, such as buying a home.

With the vector autoregression analysis, prior change in infectious disease equity market volatility predicts current values of home buying opinion ($p = 0.00$). Using the vernacular of time series analysis, infectious disease equity market volatility Granger-causes change in the level of public skepticism about buying a home. Prior change in the geopolitical risk index does not directly predict current public home buying skepticism at the .05 level of significance ($p = 0.09$).

There is the possibility that the geopolitical risk index has an indirect effect on home buying opinion, as prior change in the geopolitical risk index predicts current levels of infectious disease equity market volatility ($p = 0.00$). If change in the geopolitical risk index can predict infectious disease equity market volatility and change in infectious disease equity market volatility can predict public skepticism about home buying, the geopolitical risk index is potentially shaping the level of home buying skepticism in the public by contributing to change in infectious disease equity market volatility. Continued study can determine whether this indirect effect is observable in other countries/contexts.

The only exogenous control that has a significant effect on home buying opinion is the indicator for major infectious disease events ($p = 0.05$). The fact that both infectious disease events and equity market volatility have a significant effect on home buying opinion indicates that epidemics and pandemics introduce a significant amount of uncertainty about economic conditions that can shape decisions about the purchase of a home.

The results of the vector autoregression analysis that are fully reported in Table 2 illustrate that all variables in the system are inertial, meaning prior values of a variable can predict current values of that same variable. Prior values of the geopolitical risk index predict current values of the geopolitical risk index ($p = 0.00$), prior values of infectious disease equity market volatility predict current values of infectious disease equity market volatility ($p = 0.00$), and prior values of home buying skepticism in the public predicts current values of home buying skepticism in the public ($p = 0.00$). While inertial variables are by no means a surprise, they demonstrate the importance and value of vector autoregression analysis. It is possible to discern if dynamics over time can be predicted by other variables, recent change in a variable itself, or a combination of the two.

Although vector autoregression is advantageous in this way, the usage of prior values for all the variables in the system introduces multicollinearity, so it is necessary to examine through moving average representation whether the relationship between infectious disease equity market volatility and public skepticism about home buying is positive as predicted in the research hypothesis.

Table 2. Vector Autoregression Granger Test Results

Independent Variable	Dependent Variable	p-value [F-statistic]
Geopolitical Risk Index →	Geopolitical Risk Index	0.00* [298.6040]
Infectious Disease Equity Market Volatility		0.58 [0.5452]
Home Buying Opinion		0.16 [1.8640]
<u>Exogenous Controls</u> Major Geopolitical Events (+, p = 0.00) Major Infectious Disease Events (ns, p = 0.11) Recessions (ns, p = 0.13)		
Geopolitical Risk Index →	Infectious Disease Equity Market Volatility	0.00* [16.2482]
Infectious Disease Equity Market Volatility →		0.00* [266.0694]
Home Buying Opinion		0.62 [0.4717]
<u>Exogenous Controls</u> Major Geopolitical Events (ns, p = 0.65) Major Infectious Disease Events (ns, p = 0.88) Recessions (+, p = 0.00)		
Geopolitical Risk Index	Home Buying Opinion	0.09 [2.3812]
Infectious Disease Equity Market Volatility →		0.00* [14.8219]
Home Buying Opinion →		0.00* [766.2430]
<u>Exogenous Controls</u> Major Geopolitical Events (ns, p = 0.34) Major Infectious Disease Events (-, p = 0.05) Recessions (ns, p = 0.52)		

Note: The arrows and * indicate Granger-causality from the block of coefficients for the independent variable to the designated dependent variable based on 0.05 significance levels. All p-values derive from F-tests for the null hypothesis of no Granger-causality. The system includes a deterministic constant. The results of the exogenous controls are based on t-test results at 0.05 significance levels. A "+" represents a positive significant relationship, a "-" represents a negative significant relationship, and "ns" represents not significant. Each of the independent variables in the system includes two monthly lags to control for the inertia of the variables. Lag length is selected by Bayesian Information Criterion (BIC). VAR estimation with lags performed with information on 423 monthly usable observations (3/1985-5/2020).

Based on the dynamics collected through the moving average representation analysis depicted in Figure 1, a one standard deviation increase in infectious disease equity market volatility produces a statistically significant increase in public skepticism about home buying that persists for seven months after the change to infectious disease equity market volatility. An increase in infectious disease equity market volatility increases skepticism about home buying by about 0.12 standard deviations at one month following the change to infectious disease equity market volatility. The finding confirms the hypothesis of the project that predicts a rise in the view that current conditions for home buying are poor given disruptions in equity markets brought about by infectious diseases. Infectious disease outbreaks appear to increase concerns about the potential risks of home buying.

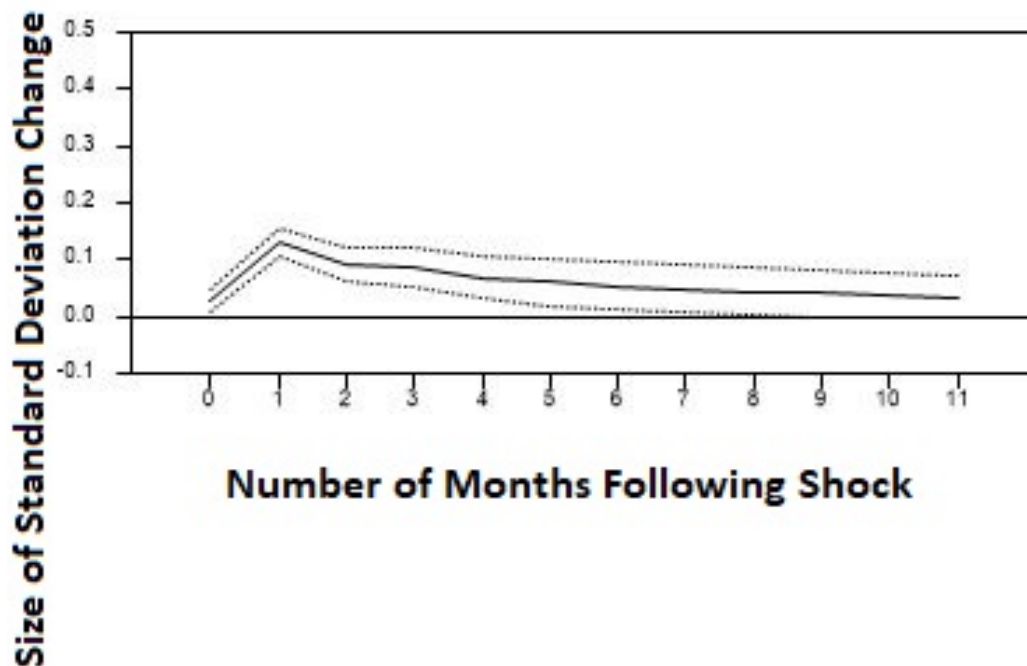


Figure 1. Public Skepticism on Home Buying After Infectious Disease Equity Market Volatility Increase

Note: The plot presents the response of public skepticism about home buying in the U.S. after a one standard deviation increase to infectious disease equity market volatility. Dashed lines represent 95% confidence intervals. For a more intuitive interpretation of change across variables in the system, each variable in the system is standardized. Standardization means each variable is rescaled to have a mean of zero and a standard deviation of one.

RESEARCH CONCLUSIONS

The current project contributes to the now rapidly growing literature on infectious disease outbreaks and consumptive behavior. While prior studies have emphasized the panic buying of goods and discussed how panic buying can be an instinctual response out of fear about lack of control and safety during infectious disease outbreaks, the findings here paint another picture worthy of attention. Consumer choices will not be uniform during infectious disease outbreaks; the decision to think that purchasing something is a good idea is dependent upon the level of risk tied to the purchase. Decision-making by consumers during infectious disease outbreaks can indeed be rational; here in this project the U.S. public expresses reticence about the idea of purchasing a home when infectious diseases introduce unpredictability and a lack of clarity in equity markets.

The economic environment is unclear when infectious disease outbreaks rattle equity markets. People respond by expressing increasingly negative views about the prospect of purchasing a home. The economic evaluation of the public is logical: when infectious disease outbreaks produce unclear economic conditions, the response of the public is to convey reluctance about buying a home. Rational decision-making entails minimizing the level of losses experienced as much as possible. Infectious disease outbreaks then can be periods where purchasing decisions are thoughtful and

considerate of available information; scholars should take pause before broadly characterizing purchasing choices during infectious disease outbreaks as panic induced.

Future research should determine whether the relationship between infectious disease equity market volatility and home buying preferences seen here also apply to other major purchases that can be time and resource-intensive, such as the purchase of an automobile or home entertainment system (television, audio speakers, video gaming consoles, etc.). Finding that the relationship in the United States between infectious disease equity market volatility and home buying skepticism is observable in other countries as well will demonstrate the profound effect infectious diseases can play in purchasing choices made across the world.

References

1. Sim, K., Chua, H.C., Vieta, E., & Fernandez, G. (2020). The anatomy of panic buying related to the current COVID-19 pandemic. *Psychiatry Research*, 288, 113015.
2. Zheng, R., Shou, B., & Yang, J. (2020). Supply disruption management under consumer panic buying and social learning effects. *Omega*, 102238.
3. Dulam, R., Furuta, K., & Kanno, T. (2020). An agent-based simulation to study the effect of consumer panic buying on supply chain. In *International Conference on Practical Applications of Agents and Multi-Agent Systems* (pp. 255-266). Springer, Cham.
4. Sheares, G., Miklencicova, R., & Grupac, M. (2020). The viral power of fake news: Subjective social insecurity, COVID-19 damaging misinformation, and baseless conspiracy theories. *Linguistic and Philosophical Investigations*, 19, 121-127.
5. Sterman, J.D., & Dogan, G. (2015). 'I'm not hoarding, I'm just stocking up before the hoarders get here:' Behavioral causes of phantom ordering in supply chains. *Journal of Operations Management*, 39, 6-22.
6. Kyrios, M., Frost, R.O., & Steketee, G. (2004). Cognitions in compulsive buying and acquisition. *Cognitive Therapy and Research*, 28(2), 241-258.
7. Arafat, S., Kar, S.K., Marthoenis, M., Sharma, P., Hoque Apu, E., & Kabir, R. (2020). Psychological underpinning of panic buying during pandemic (COVID-19). *Psychiatry Research*, 289, 113061.
8. Sim, K., Chan, Y.H., Chong, P.N., Chua, H.C., & Soon, S.W. (2010). Psychosocial and coping responses within the community health care setting towards a national outbreak of an infectious disease. *Journal of Psychosomatic Research*, 68(2), 195-202.
9. Maunder, R., Hunter, J., Vincent, L., Bennett, J., Peladeau, N., Leszcz, M., Sadavoy J., Verhaeghe L.M., Steinberg R., & Mazzulli, T. (2003). The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *Cmaj*, 168(10), 1245-1251.
10. Ahmed, K. (2020). Patterns of social reactions to COVID-19 pandemic; reasons & proposed ways to overcome. *Advanced Journal of Social Science*, 7(1), 54-59.
11. Leach, J. (1994). *Survival psychology*. Springer.
12. Yuen, K.F., Wang, X., Ma, F., & Li, K.X. (2020). The psychological causes of panic buying following a health crisis. *International Journal of Environmental Research and Public Health*, 17(10), 3513.
13. Bonneux, L., & Van Damme, W. (2006). An iatrogenic pandemic of panic. *Bmj*, 332(7544), 786-788.
14. Depoux, A., Martin, S., Karafillakis, E., Bsd, R.P., Wilder-Smith, A., & Larson, H. (2020). The pandemic of social media panic travels faster than the COVID-19 outbreak. *Journal of Travel Medicine*, 27(3), taaa031.
15. Schell, H. (1997). Outburst! A chilling true story about emerging-virus narratives and pandemic social change. *Configurations*, 5(1), 93-133.

16. Singer, E., & Endreny, P.M. (1993). Reporting on risk: How the mass media portray accidents, diseases, other hazards. Russell Sage Foundation.
17. Steven, D., O'Brien, E., & Jones, B.D. (Eds.). (2014). The new politics of strategic resources: Energy and Food Security Challenges in the 21st century. Brookings Institution Press.
18. Ho, C.S., Chee, C.Y., & Ho, R.C. (2020). Mental health strategies to combat the psychological impact of COVID-19 beyond paranoia and panic. *Annals, Academy of Medicine, Singapore*, 49(1), 1-3.
19. Fischhoff, B., and Kadvany, J. (2011). Risk: A very short introduction. Oxford: Oxford University Press.
20. Tversky, A., and Fox, C.R. (1995). Weighing risk and uncertainty. *Psychological Review*, 102(2): 269–283.
21. Baldwin, R. (2020, March 22). The supply side matters: Guns versus butter, COVID-style. VOX CEPR Policy Portal. <https://voxeu.org/article/supply-side-matters-guns-versus-butter-covid-style>.
22. Mnasri, A. (2015). Renting vs buying a home: A matter of wealth accumulation or of geographic stability? *Journal of Economic Dynamics and Control*, 60, 42-72.
23. Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*, 78, 185-193.
24. White, B.J., & Barclay, N.A. (1981). Factors underlying consumer difficulties with the homebuying process. *Home Economics Research Journal*, 10(2), 181-191.
25. Liu, L., & Zhang, T. (2015). Economic policy uncertainty and stock market volatility. *Finance Research Letters*, 15, 99-105.
26. Baker, S.R., Bloom, N., Davis, S.J., Kost, K.J., Sammon, M.C., & Viratyosin, T. (2020). The unprecedented stock market impact of COVID-19 (No. w26945). National Bureau of Economic Research.
27. Curtin, R.T. (1982). Indicators of consumer behavior: The University of Michigan surveys of consumers. *Public Opinion Quarterly*, 46(3), 340-352.
28. Caldara, D., & Iacoviello, M. (2019). Measuring geopolitical risk. Board of Governors of the Federal Reserve Board. <https://www.matteoiacoviello.com/gpr.htm>.
29. Freeman, J.R., Williams, J.T., & Lin, T.M. (1989). Vector autoregression and the study of politics. *American Journal of Political Science*, 33(4), 842-877.
30. Sims, C.A. (1980). Macroeconomics and reality. *Econometrica*, 48(1), 1-48.
31. Granger, C.W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37(3), 424-438.
32. Sims, C.A., & Zha, T. (1999). Error bands for impulse responses. *Econometrica*, 67(5), 1113-1155.