

COVID-19 AND THE UPPER MIDWEST COMPANY STOCKS

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In 2020 COVID-19 emerged as the global pandemic and impacted human lives and economies. With COVID-19 ravaging humans, as reflected by the number of cases and deaths, the federal and state governments of the United States responded by locking down economies and movement of people and implementing three stimulus packages to cushion the slowdown of economic activities and loss of jobs. With vaccinations against the virus, economies have started reopening and reestablishing jobs. It is extremely important to study how economies reacted to events related to the pandemic. This paper provides analysis on how the financial indicators, stock and commodity returns, reacted in real time to different stages of COVID-19. This study collected data on COVID-19 related major event dates and returns of ten stocks and commodities on those dates to study responses of the U.S. and three upper Midwest states. Through empirical analysis we find that returns on financial/industrial stocks reacted more than the returns on agricultural commodities. Overall, the stocks associated to Michigan had more negative responses while stocks related to Minnesota had positive responses. We find that the WHO declaration of the pandemic caused downturn in almost all stock returns while stimulus packages and vaccination improved reactions of the financial indicators. The results show that initially market over-reacted with COVID-19 cases and deaths, and as more information became available, people started adjusting their expectations to pandemic related events and market started correcting itself.

Introduction

The United States (U.S.) recorded the first COVID-19 case on January 21, 2020. Since then the U.S. has accumulated over 33 million cases of COVID-19, over 600 thousand deaths, and administered over 300 million vaccinations. During this devastating time for the entire world the economy of the U.S. took a massive hit. To lower the spread of the virus, the U.S. federal and state governments decided to lockdown the economy. The U.S. GDP decreased by 2.3% or about \$500 billion. The growth rate of real GDP declined nearly -3.51% from 2019 to 2020. The unemployment rate in the U.S. rose from 3.7% in 2019 to 8.1% in 2020. The U.S. seemingly risked the economy for the overall health of the U.S. population.

During the devastating COVID-19 pandemic there is no rulebook, no policy prescriptions, and no models that governments can reference. Much of the learning during the containment of the pandemic was self-taught, self-learned and learned from other states and countries. This is precisely what the experience of COVID-19 has taught us and is still teaching us. We have now seen how COVID-19 has unfolded and at which point the devastation has slowed and recovery has begun. This pandemic stressed governments at state and federal levels and people living across the U.S. The development and distribution of a vaccine is not the only thing that science needed to figure out but also the need to understand the evolutions and future mutations of the COVID-19 virus. Social and economic stability rests on the accuracy to answer those questions. It is necessary to learn the medical side of COVID-19 as well as its economics and the unpredictability that people faced with not knowing what to expect in days, weeks, and months ahead.

This paper focuses on the following question. How has COVID-19 affected the financial and commodity markets of the U.S. upper Midwest region? We aim to answer this question to better understand the true impact of COVID-19 on a regional level within the U.S. This paper attempts to expand on the global impact of COVID-19 that Phan and Narayan (2020) studied. Following their research we investigate the fact that COVID-19 represents fear of the unknown in the economic realm. All the stocks and commodities we investigate have investors affected by COVID-19 and every stakeholder is expected to make a loss due to the pandemic. The local and federal governments are the lead investors as they want to minimize losses for all. We research at the state level in the U.S. and local companies and commodities represented in the upper Midwest states to examine how each state reacted to the pandemic. We relate the policy responses to reactions of the stock returns of companies and commodities heavily represented in the three Midwest states. The goals are to identify trends in the stock returns and potential implications of how those indices can use this information for future pandemics. We conduct an empirical research on three Midwest states of the U.S. and the ramifications the pandemic may have at the regional level.

In this paper, we study federal and local government responses to COVID-19 for the U.S., Michigan, Minnesota, and Wisconsin and the returns of

stocks and commodities that are heavily represented in those upper Midwest states. The data signal possible overreactions and market corrections as COVID-19 evolved. We observe stocks and commodity returns and how they reacted to cases, deaths, and vaccinations associated with COVID-19. We find that during the early stages of the pandemic many of the stocks and commodities reacted negatively trending downward. However, gradually when the indices began to reach the higher milestones in each event category, stocks began to recover and started trending positively.

We organize the paper into five sections. The first is the introduction, which includes the research background. The next section is literature review. We then explain our data and methodology in the third section. In the fourth section, we explain our findings and discuss results of the U.S., Michigan, Minnesota, and Wisconsin. The last section provides the conclusion of the study.

Literature Review

In 2020 the COVID-19 pandemic tremendously affected the health, social, economic, and financial lives of people around the world. We study how COVID-19 affected the financial market. Specifically, how the Midwest company stock prices are impacted during the major events associated with the pandemic. We search the major event dates of the pandemic based on declaration by the World Health Organization (WHO), the U.S., and the Midwest states. This topic is important because it is a useful guide for the local economy as we will study local companies in the states of Michigan, Minnesota, and Wisconsin. Reaction of the regional economy is a significant indicator and can gauge how locals feel in that area around a major event.

Stock Market Literature

In this section we researched articles related to the stock market during the COVID-19 pandemic. Albuquerque, Koskinen, Yang, and, Zhang (2020) investigated theories of environmental and social policies that the COVID-19 pandemic and subsequent lockdowns brought on the economies. This paper highlighted the importance and likelihood of investors staying loyal to their originally invested specific stocks. The article on 2020 annual review of private markets written by McKinsey & Company (2020) analyzed the long-running research on private markets and industry leading data sources. The authors gathered worldwide data on gross profits and limited partnerships to draw comparisons of private markets. In another study, Robertson (2021) looked at how private equity performed and reacted to the COVID-19 pandemic. The article stated that

deal-making was changed a lot by COVID-19 and market found a better way to make deals. Williams and Young (2020) analyzed a study done by FINRA Foundation and NORC that showcased the volatility of the housing market during the pandemic.

US Stock Market during COVID-19

In this section we take a deeper look into the US stock market to get a sense of where people are in terms of the pandemic and if there is optimism or pessimism. Two articles written by Fontes, Ganem, Lush and Mottola (2020a, 2020b) investigated market volatility during COVID-19 and its effects on minority groups in the U.S. The first paper (2020a) found that both the African American and Hispanic/Latino households were less optimistic on the recovery timeline of the market and the stock market was shrouded with uncertainty. In their second article (2020b) they found that while some of the investors reported major negative impacts on their investments, many of those investing still had high optimism about investment and believed the stock market was resilient and would remain high. The paper by Tompor (2021) detailed how volatile the market became during the COVID-19 pandemic. The author pointed out the fact that many of the new investors are young people who are more diverse and willing to buy seemingly random stocks like GameStop. In a similar study Robertson (2021) researched the rise of new investors in the stock market. The author stated that the rise in younger investors has led to an influx of “meme stocks” being purchased like GameStop and Dogecoin. The Conference Board (2021) discussed a survey conducted on American consumers. The survey investigated consumers’ concerns, spending priorities, and financial health. It utilized charts that are useful about stock investments and household improvements by category for our research.

Global Stock Market

There are multiple articles written on various global financial market reactions to the COVID-19 pandemic. The article by Gherghina, Armeanu, and Joldes (2020) examined stock market returns in the U.S., Romania, China, Germany, Spain, Italy, France, and the UK. The paper by Liu, Manzoor, Wang, Zhang, and Manzoor (2020) investigated the top 21 stock market indices around the world. Their analysis included the U.S., Germany, Japan, Korea, Italy, Singapore, and the UK. The authors found that countries in Asia had more negative returns when they were compared to countries of Europe and North America. The article by Phan, and Naryan (2020) showcased how 25 countries have responded to COVID-19 as reflected through

their stock markets reactions. This study analyzed the real time reaction of stock prices as many of the different lockdowns and events happened. The article explained what each of those previous events meant for the stock market and the effect the events had on stocks. Authors found stock market overreacted with unexpected news of the pandemic and as more information became available market corrected itself. An article by the World Bank Group (2021) investigated the current global outlook after the COVID-19 pandemic. This article investigated some regional prospects, the global economy, and the potential that this decade might be filled with disappointment and how the asset purchases by central banks had stabilized financial markets in emerging markets and developing economies during the pandemic.

Research Question

Literature review helped to shape our research topic. There is a growing number of research on how COVID-19 affected the stock market. However, there is a lack of study on the impact of the pandemic on company stocks of specific region or states of the U.S. Our research question is how COVID-19 affected Midwest company stock and commodity prices during the major events associated with the pandemic. We focus on the major events dates related to the pandemic. The WHO declaration of the pandemic, lockdowns, U.S. declaration of stimulus package 1, 2, and 3, and travel bans placed in the states of Minnesota, Michigan, and Wisconsin. We study when these states reached their first, 100, 500 and 1,000 cases of coronavirus and effects of these events on certain stock prices. Further, we investigate the effect of COVID-19 deaths on the returns of stocks and commodities using the same milestones as the virus cases. Through this investigation our goal is to study percentage change in the stock price index returns on the above-mentioned pandemic related macro event dates in the U.S. and the Midwest states. This paper contributes to the existing literature by conducting study on impacts of COVID-19 related events on the financial market. This study focuses on stock returns as well as returns on commodities during the COVID-19 related events. Further, the paper fills gap of research on regional economy by studying upper Midwest states of the U.S.

Data & Methodology

Data

The data used in this study begins with the macroeconomic events of COVID-19, this includes WHO declaration of the pandemic, lockdown, three stim-

ulus packages provided by the U.S. federal government, travel ban, and peacetime emergency. We then look at the number of cumulative infected cases, cumulative deaths, and cumulative vaccinations in the U.S. and the three upper Midwest states, namely, Michigan, Minnesota, and Wisconsin. Information on these events are collected from publicly available websites using Google News (2020) statistics. From Trading Economics (2021) and Macrotrends (2021) we collected the stock/commodity prices for the specified dates to analyze the trends and measure the volatility of indexes. The data ranges from January 2020 to April 2021. This range shows the start of the COVID-19 pandemic to the milestones of 3 million vaccines distributed in the U.S. and the three upper Midwest states.

Methodology

This research is an exploratory analysis using quantitative and qualitative data from secondary sources to study how COVID-19 related events impacted stock/commodity indexes. First, we conducted a literature review on the chosen topic. Based on the literature, we collected various dates (e.g., date of declaration of the pandemic, date of lockdowns, date of first 100 cases, date of first 100 deaths, date of first 100 vaccinations, etc.) to record COVID-19 related major macroeconomic events. These event dates are recorded for the U.S. and three upper Midwest states. Next, we chose major companies that are prevalent to the above-mentioned locations. To learn about the financial market, we studied how those companies reacted on the pandemic related major event dates in terms of returns on the stocks and commodities. We analyzed and displayed the data using trend lines and tables. Finally, we compared the findings of the U.S. and the three upper Midwest states in detail in this paper.

Results

COVID-19 Related Events

Table 1 records COVID-19 related event dates. It shows data provided by multiple sources to find out the major events associated with the COVID-19 in the U.S., Michigan, Minnesota, and Wisconsin. Panel A shows the macro event dates associated with the COVID-19 pandemic. As seen in this panel, the U.S., and the three corresponding states have the same dates for many of the events. The only variation we see in event dates in Panel A is the statewide lockdowns, and peacetime emergency declarations. According to the Lockdown column, the U.S. declared lockdown first and Minnesota was the last to enforce their lockdown. Peacetime Emergency was first declared in Michigan while Minne-

sota and the U.S. were tied for last to do so.

Panel B of Table 1 represents the cumulative infected cases milestones, from first case to 100,000 cases. Cumulative infected cases are chosen as these were some of the first massive events seen during COVID-19. When looking at this panel we see that the U.S. is the fastest to reach all the milestones. Wisconsin had the earliest date for their first case of COVID-19 being on February 5, 2020. Minnesota ended up being the slowest to reach the last milestone of 100,000 COVID-19 cases on October 1, 2020. Michigan had the highest rate of infected cases of the three states reaching 100,000 cases in about five months.

Panel C of Table 1 shows how quickly the U.S., Michigan, Minnesota, and Wisconsin reached the milestones of their first death to 5,000 deaths. Obviously, the U.S. was the fastest in terms of reaching each of the death milestone numbers. The U.S. had their first death on March 1, 2020 and reached 5,000 deaths on April 2, 2020. Michigan experienced their first death the earliest, on March 18,

2020. Wisconsin was the slowest overall in reaching the final milestone of 5,000 deaths on December 24, 2020. Michigan experienced the fastest rate of death reaching 5,000 deaths in almost two months.

Lastly, Panel D of Table 1 vaccine distribution shows how quickly each state and the U.S. rolled out vaccinations to the public. The U.S. was the fastest in terms of reaching all the milestones distribution, the first vaccine on December 20, 2020, and 3 million vaccines on January 1, 2021. As for the states, Minnesota was the fastest to get out their first vaccine on January 1, 2021. Michigan overall was the fastest state reaching 3 million vaccines on March 13, 2021. To provide 3 million vaccines it took Michigan two months, Wisconsin two and a half months and Minnesota three months.

Timeline of COVID-19 Related Events

For Table 2 ‘Timeline of COVID-19 Related Events’ the data provided in Table 1 is expanded to see the responses of the U.S. government and individual state governments. Table 2A records how

Panel A: Macro Events							
	Travel Ban	WHO Declaration	Peacetime Emergency	Lockdown	Stimulus Package1	Stimulus Package2	Stimulus Package3
U.S.	31-Jan-20	11-Mar-20	13-Mar-20	19-Mar-20	11-Apr-20	29-Dec-20	12-Mar-21
Michigan	31-Jan-20	11-Mar-20	10-Mar-20	23-Mar-20	11-Apr-20	29-Dec-20	12-Mar-21
Minnesota	31-Jan-20	11-Mar-20	13-Mar-20	27-Mar-20	11-Apr-20	29-Dec-20	12-Mar-21
Wisconsin	31-Jan-20	11-Mar-20	12-Mar-20	25-Mar-20	11-Apr-20	29-Dec-20	12-Mar-21
Panel B: Cumulative Infected Cases							
	First Case	100 Cases	500 Cases	1,000 Cases	5,000 Cases	10,000 Cases	100,000 Cases
U.S.	21-Jan-20	3-Mar-20	8-Mar-20	11-Mar-20	17-Mar-20	20-Mar-20	28-Mar-20
Michigan	11-Mar-20	19-Mar-20	20-Mar-20	22-Mar-20	29-Mar-20	2-Apr-20	14-Aug-20
Minnesota	6-Mar-20	20-Mar-20	29-Mar-20	7-Apr-20	30-Apr-20	8-May-20	1-Oct-20
Wisconsin	5-Feb-20	18-Mar-20	25-Mar-20	28-Mar-20	23-Apr-20	9-May-20	17-Sep-20
Panel C: Cumulative Death							
	First Death	100 Death	500 Death	1,000 Death	5,000 Death		
U.S.	1-Mar-20	18-Mar-20	23-Mar-20	26-Mar-20	2-Apr-20		
Michigan	18-Mar-20	28-Mar-20	4-Apr-20	9-Apr-20	19-May-20		
Minnesota	21-Mar-20	17-Apr-20	7-May-20	29-May-20	23-Dec-20		
Wisconsin	19-Mar-20	8-Apr-20	23-May-20	7-Aug-20	24-Dec-20		
Panel D: Vaccine Distribution							
	First Vaccine	200,000 Vaccines	500,000 Vaccines	1 Million Vaccines	3 Million Vaccines		
U.S.	20-Dec-20	20-Dec-20	20-Dec-20	23-Dec-20	1-Jan-21		
Michigan	13-Jan-21	13-Jan-21	21-Jan-21	1-Feb-21	13-Mar-21		
Minnesota	1-Jan-21	19-Jan-21	31-Jan-21	19-Feb-21	4-Apr-21		
Wisconsin	13-Jan-21	19-Jan-21	1-Feb-21	17-Feb-21	2-Apr-21		

Table 1

List of COVID-19 Related Event Dates

Panel A: Number of Days from WHO Pandemic Declaration to Events							
	First Death	100 Deaths	500 Deaths	1,000 Deaths	5,000 Deaths	10,000 Cases	100,000 Cases
U.S.	-10	7	12	15	22	3	17
Michigan	7	17	24	29	69	22	156
Minnesota	10	37	57	79	287	58	204
Wisconsin	8	28	73	149	288	59	130

Panel B: Number of Days from Lockdown to Events							
	First Death	100 Deaths	500 Deaths	1,000 Deaths	5,000 Deaths	10,000 Cases	100,000 Cases
U.S.	-18	-1	4	7	14	1	9
Michigan	-1	9	16	21	61	14	148
Minnesota	2	29	49	71	279	128	196
Wisconsin	0	20	65	141	280	127	182

Panel C: Number of Days from Travel Ban to Events							
	First Death	100 Deaths	500 Deaths	1,000 Deaths	5,000 Deaths	10,000 Cases	100,000 Cases
U.S.	28	46	51	54	61	48	56
Michigan	46	56	63	69	108	61	196
Minnesota	49	76	96	118	336	97	243
Wisconsin	47	67	112	189	337	98	229

Panel D: Number of Days from Peacetime Emergency to Events							
	First Death	100 Deaths	500 Deaths	1,000 Deaths	5,000 Deaths	10,000 Cases	100,000 Cases
U.S.	-12	5	10	13	20	7	15
Michigan	8	18	25	30	70	23	157
Minnesota	8	35	55	77	285	56	202
Wisconsin	7	27	72	148	287	58	189

Table 2A

Timeline of COVID-19 Related Events - Closings

many days passed between the different numbers of pandemic related deaths and cases since WHO declared the pandemic, the U.S. ordered travel ban, and three states declared lockdowns and peacetime emergency. Table 2B records how many days passed between the different numbers of pandemic related deaths and cases since the U.S. government provided the three Stimulus Packages.

According to the Panel A of Table 2A, we find that only in the U.S. the first death took place 10 days before the Who Declaration. Minnesota experienced their first death 10 days after the declaration and was the slowest to reach their first death. Minnesota also experienced 100,000 cases the last of the three Midwest states while the U.S. was the first to reach that milestone in 17 days. Wisconsin was the slowest to reach 5,000 deaths, 288 days after the Who Declaration.

Panel B of Table 2A looks at the number of days from the lockdowns to the death and case events. Minnesota and Wisconsin were the only two to not experience a macro event before declaring their individual lockdowns. The U.S. had their first death 18 days before they declared lockdown and their 100 death happened 1 day before lockdown. Michigan had their first death 1 day before declaring their state lockdown. Minnesota was the last to experience their 100,000 cases, 196 days after declaring lockdown. Wisconsin reached their 5,000 deaths

280 days after their lockdown, making them the slowest state to reach that milestone.

Panel C of Table 2A shows the number of days from the travel ban enacted by the U.S. to the death and case events. All three states and the U.S. experienced their first death after the travel ban was declared, Minnesota was the last to experience their first death, 49 days after the travel ban happened. Wisconsin was the last to experience 5,000 deaths, 337 days after the travel ban was enacted. Minnesota was the last to reach 100,000 cases, 243 days after the travel ban was enacted by the U.S.

Panel D of Table 2A showcases the number of days from the peacetime emergency declarations to the death and case events. The U.S. was the only one to experience their first death 12 days before the peacetime emergency declaration. Minnesota had the greatest number of days, 202 days, to reach 100,000 virus cases after the declaration. Wisconsin was the slowest to reach 5,000 deaths milestone, 287 days after the peacetime emergency declaration.

Table 2B showcases the number of days from three of the U.S. stimulus packages to the death and case events. The U.S., Michigan, Minnesota, and Wisconsin, all experienced their first death before the first stimulus package was disbursed. Every state as well as the U.S. experienced their 5000 deaths and 100,000 COVID-19 cases before Stimulus Packages 2 and 3 were distributed.

Panel A: Number of Days from Stimulus Package 1 to Events							
	First Death	100 Deaths	500 Deaths	1,000 Deaths	5,000 Deaths	10,000 Cases	100,000 Cases
U.S.	-41	-24	-19	-16	-9	-22	-14
Michigan	-24	-14	-7	-2	38	-9	125
Minnesota	-21	6	26	48	256	27	173
Wisconsin	-23	-3	42	118	257	28	159

Panel B: Number of Days from Stimulus Package 2 to Events							
	First Death	100 Deaths	500 Deaths	1,000 Deaths	5,000 Deaths	10,000 Cases	100,000 Cases
U.S.	-303	-286	-281	-278	-271	-284	-280
Michigan	-286	-276	-269	-264	-224	-271	-227
Minnesota	-283	-256	-236	-214	-6	-235	-157
Wisconsin	-285	-265	-220	-144	-5	-234	-158

Panel C: Number of Days from Stimulus Package 3 to Events							
	First Death	100 Deaths	500 Deaths	1,000 Deaths	5,000 Deaths	10,000 Cases	100,000 Cases
U.S.	-376	-359	-354	-351	-344	-357	-353
Michigan	-359	-349	-342	-337	-297	-344	-299
Minnesota	-356	-329	-309	-287	-79	-308	-248
Wisconsin	-358	-338	-293	-217	-78	-307	-231

Table 2B:

Timeline of COVID-19 Related Events – Government Support

List of States and Stock/Commodity Index

In Table 3 we designate certain stocks/commodities to a specific state. The S&P 500 Index and crude oil are chosen for the U.S. The S&P 500 is chosen as it is the most accurate depiction of the U.S. economy as it represents the 500 largest U.S. companies. Crude oil is designated to the U.S. due to the vast diversity of where oil is found in the U.S.

Table 3: List of States and Indexes

States	Stock/Commodity Index
United States	S&P 500
United States	Crude Oil
Michigan	United States Steel
Michigan	Morgan Stanley
Minnesota	Corn
Minnesota	Soybeans
Minnesota	UnitedHealth Group
Wisconsin	Cheese
Wisconsin	Dairy
Wisconsin	Enbridge Inc.

Table 3

List of States and Indexes

For Michigan, United States Steel and Morgan Stanley are designated because of their importance in that state. United States Steel has multiple operations in Michigan and represents how other steel companies might be performing. Morgan Stanley is designated to Michigan due to the high volume of banks operating in Michigan and is appropriate to study as it represents the financial sector. For

Minnesota, corn, soybean, and UnitedHealth Group are chosen. Corn is designated to Minnesota as this state is the fourth largest corn producer in the U.S. and the highest producer among the chosen three states. Soybean is designated to Minnesota as the state is the third highest producer of soybean in the U.S. and the highest producer among the three states chosen in this study. UnitedHealth Group is designated to Minnesota as it is headquartered at Minnetonka, Minnesota and operates locally in the northeast Minnesota area. Wisconsin is designated with cheese, dairy, and Enbridge Inc. Wisconsin is the number one producer of cheese in the U.S. and the second highest producer of dairy in the U.S. Enbridge Inc. is tied to Wisconsin as multiple gas pipelines of the company are running through the state and has operations in the regional area.

Discussion

Returns on Stocks and Commodities

Figures in Panel A show the returns of the stocks/commodities (listed in Table 3) on the dates of pandemic related events specific to the U.S. and the three Midwest states. The most volatile stock is United States Steel seen in Figure 1B. United States Steel in Michigan has the lowest return at -51.52% on Stimulus Package 1 date and the highest return at 73.05% during the disbursement of Stimulus Package 3. The least volatile stock is Milk in Wisconsin seen in Figure 1E. Milk experienced its lowest return of -0.19% on Stimulus Package 1 date and its highest return of 0.38% during the disbursement of Stimulus Package 2. The events that proved to cause the most negative returns for all stocks are WHO

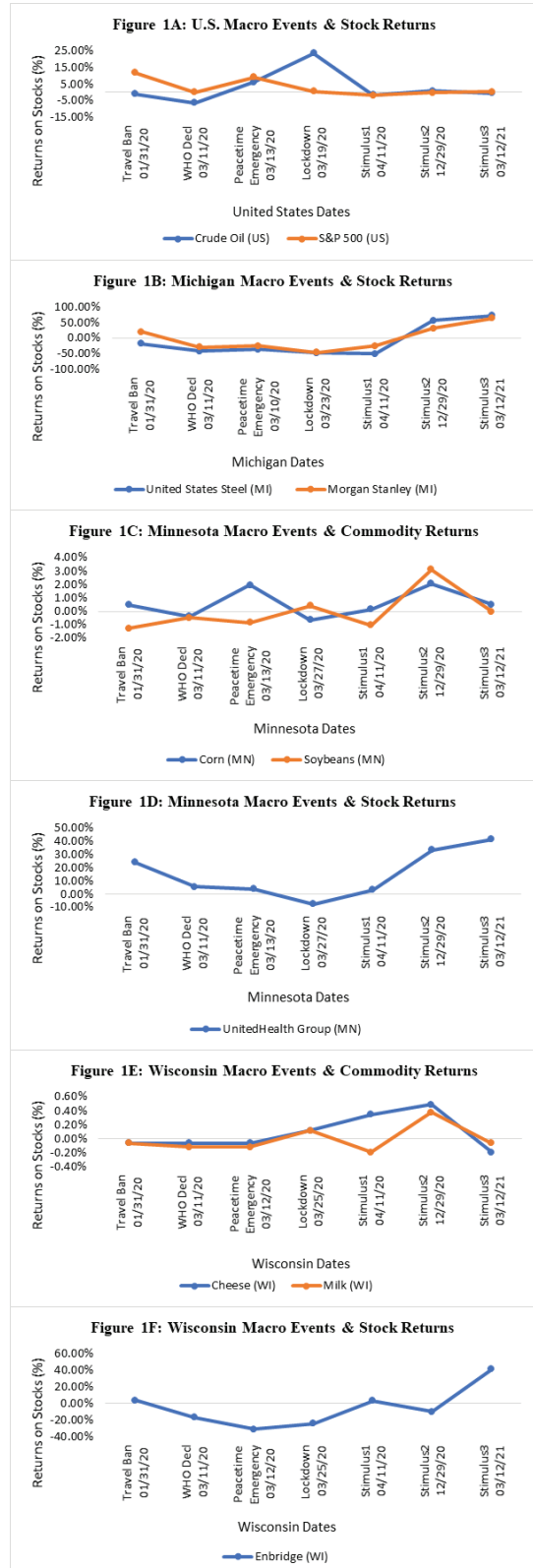
declaration, Lockdown, and Peacetime Emergency.

Panel B shows the returns of the stocks/commodities associated with the cumulative number of COVID-19 cases. The most volatile stock is Morgan Stanley seen in Figure 2B. Morgan Stanley experienced its lowest return at -46.95% when Michigan reached 1,000 cases and its highest return at 1.35% when Michigan hit 100,000 COVID-19 cases. The least volatile stock is represented by Cheese seen in Figure 2E. Cheese experienced its lowest return of -0.41% when Wisconsin reached 500 cases and its highest return of 0.81% when Wisconsin reached 10,000 cases. Overall, stocks and commodities saw a sharp decline in returns during the first three milestones of cases but slowly recovered as cases increased.

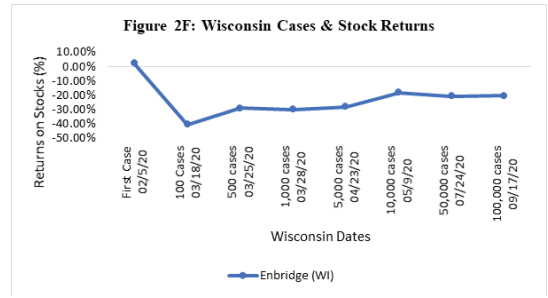
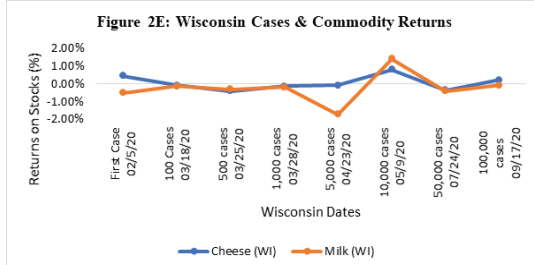
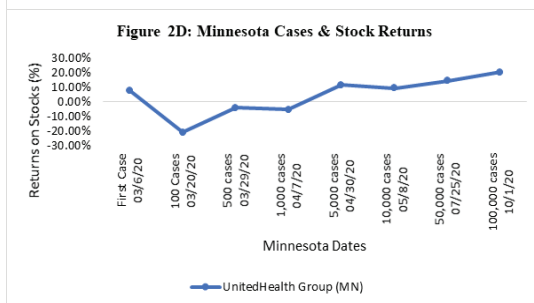
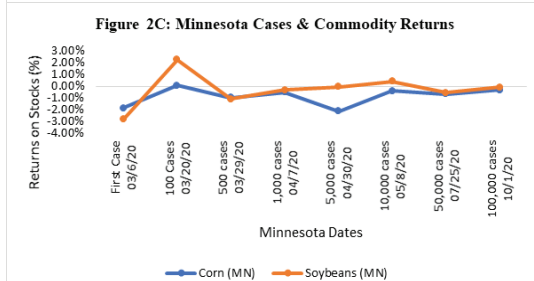
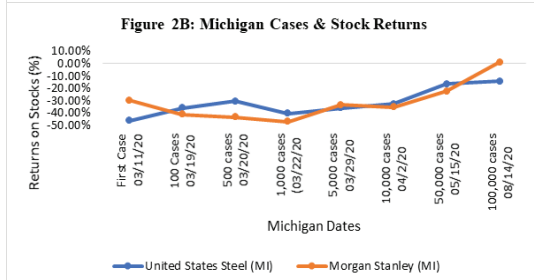
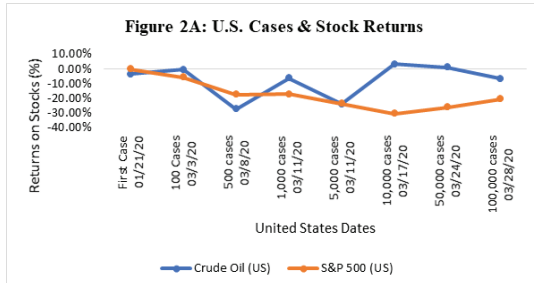
Panel C shows the returns of the stocks/commodities associated with the cumulative number of COVID-19 deaths. The most volatile stock is UnitedHealth Group seen in Figure 3D. UnitedHealth's lowest return at -25.61% reached when Minnesota experienced first death and its highest return at 30.42% when Minnesota reached 5,000 deaths. The least volatile stock is represented by Cheese seen in Figure 3E. Cheese experienced its lowest return of -1.96% when Wisconsin reached 100 deaths and its highest return of 0.31% when Wisconsin reached 5,000 deaths. Overall, most stock returns were initially negative but returns started to trend upwards as deaths increased.

Panel D shows the returns of the stocks/commodities associated with the cumulative number of vaccinations. The most volatile stock is Morgan Stanley seen in Figure 4B. Morgan Stanley saw its lowest return at -0.29% when Michigan reached 1 million vaccinations and its highest return at 23.56% when Michigan reached 3 million vaccinations. The least volatile stock is represented by Milk (dairy) seen in Figure 4D. Milk experienced its lowest return of -1.35% when Wisconsin reached 3 million vaccines and its highest return of 0.12% when Wisconsin reached 200,000 vaccines. Overall, returns of half of the stocks/commodities experienced declines when the first vaccination was administered. However, most of the stocks saw the greatest number of positive trends during increasing vaccination period while commodities experienced the opposite.

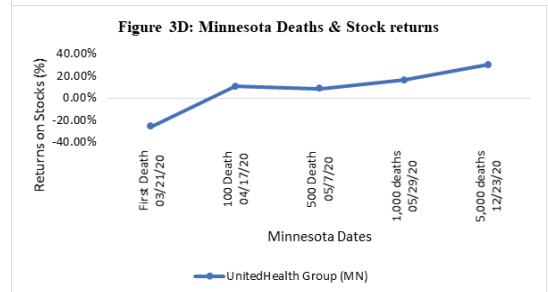
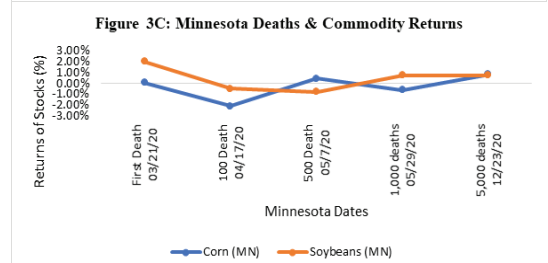
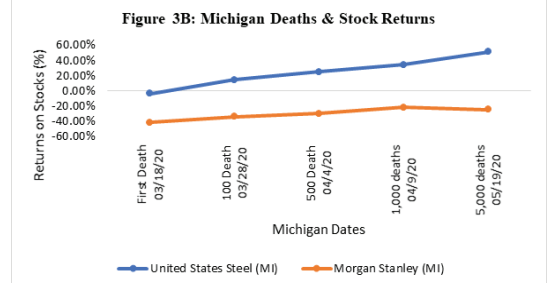
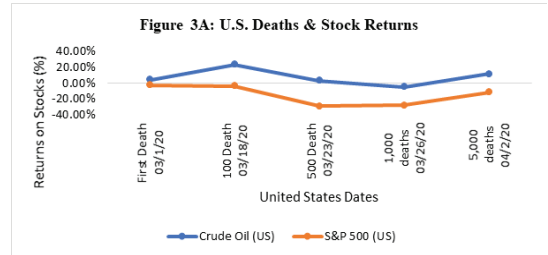
Panel A: Macro Events & Stock Returns

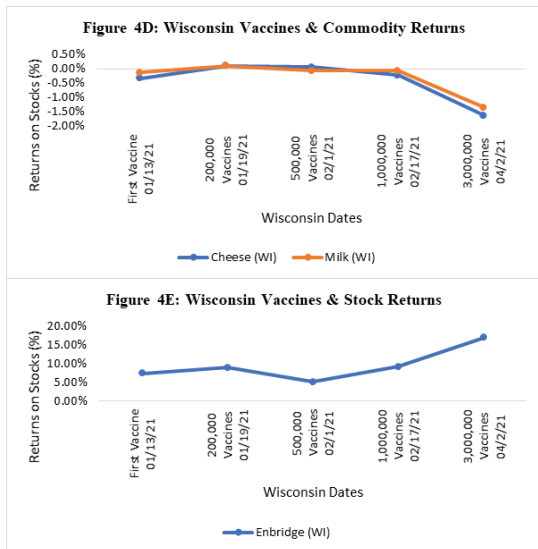
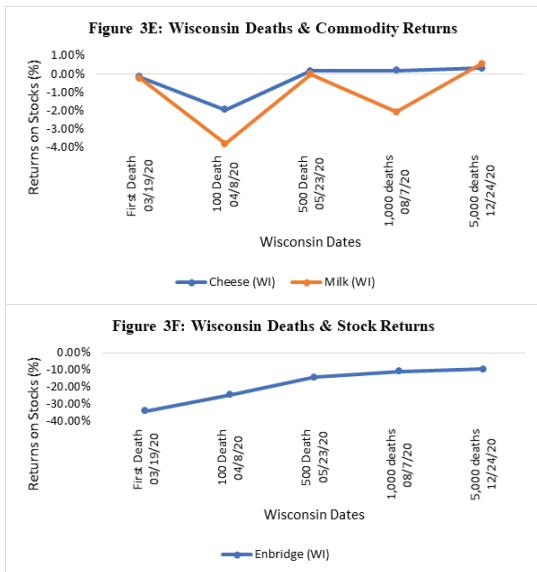


Panel B: Cumulative Infected Cases & Stock Returns

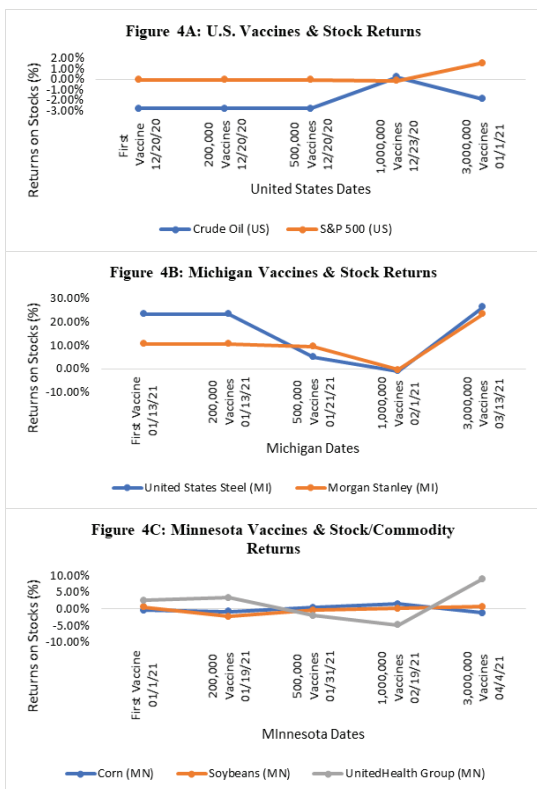


Panel C: Cumulative Deaths & Stock Returns





Panel D: Cumulative Vaccinations & Stock Returns



Comparison among Financial Stocks and Commodities

In Panel A figures, regarding major macro events related to the pandemic, the commodities were not as volatile as the financial/industrial stocks. Initially all stock and commodities experienced negative returns. However, the disbursement of Stimulus Package 1 started a positive trend in all returns. In Panel B figures which show number of COVID-19 cases, the commodities again were not as volatile as the financial/industrial stocks, but all the commodity returns were trending upward while the financial/industrial stocks had negative returns. In Panel C figures the commodities were not as volatile as the financial/industrial stocks, but they all had an upward trend during the death milestones. In Panel D figures regarding number of vaccines administered, again the commodities were not as volatile as the financial/industrial stocks. All the stock returns had a downward trend until the last milestone (3 million vaccines), when those experienced upward spike. Financial/industrial stocks were more volatile due to the differences in supply and demand tactics. Findings by Tompor (2021) support the volatility of the stock market during the pandemic. Commodities have less change in returns due to their constant high demand. Further, supply of agricultural commodities takes time to change due to their production cycle.

Comparison among Locations

In Panel A figures during major macro events Figure 1B displays that Michigan stocks oversaw the most volatile stocks. In Panel B figures of COVID-19 cases, we see a mix of upward and downward trends. In Figure 2B Michigan stocks oversaw the most negative returns and in Figure 2D Minnesota

stocks had the most positive trend. In Panel C figures of number of COVID-19 related deaths, we find an overall upward trend for the indices. Figure 3B shows that stocks related to Michigan had the most overall negative returns and in Figure 3D we see that stock related to Minnesota had the most overall positive returns. In Panel D figures related to number of vaccines administered, we see an overall downward trend until a last milestone upward spike. Figure 4B shows two Michigan stocks had mostly positive returns while Wisconsin stock did not experience any negative returns in Figure 4D. Figure 4A shows that the U.S. stock and commodity mostly had negative returns. The U.S. saw negative returns due to crude oil price going down during the pandemic and Minnesota saw positive returns due to UnitedHealth Group having an increased involvement throughout the pandemic. Michigan flipped from a downward to an upward trend due to the high optimism with rising vaccination, and people began to feel better about spending money.

Comparison among COVID-19 Related Policies

The indices moved at different speeds to embrace and implement policies with respect to the declaration of pandemic status of COVID-19. Most of the indices correspond to the same dates for events but through learning from each other they have different response times in a few indicators. There was a lot of uniformity as most of the bans and regulations were placed on a national level set by the U.S. government but different implementations of policies by states. Judging by the reaction of the stock returns it seems a combination of travel bans, lockdowns, and stimulus packages did work in reducing volatility of stocks. From our data the WHO declaration was the single most devastating event for the stocks and commodities. This makes sense as it was the very first worldwide event regarding the pandemic. The data also points out a possible overreaction and a market correction. When we analyze how each of the stocks and commodities reacted to cases of COVID-19 infections, deaths, and vaccines, we see that during the early stages of cases and deaths, the stock and commodity returns had a negative reaction but as time went on the reaction began to slowly become more positive and had an upward trend. This implies that gradually stock and commodities learned to adjust to the pandemic related events. These results are similar to the findings of Fontes et al. (2020b) and Phan and Narayan (2020).

Conclusion

This paper studies how COVID-19 has affected the financial and commodity markets in the U.S. Midwest region. Since January 21, 2020, the U.S.

has experienced over 33 million cases of COVID-19, over 600 thousand deaths, and rolled out over 300 million vaccines. The U.S. GDP has decreased by 2.3% since then and the growth rate of real GDP decline by 3.51%. Through analyzing the U.S., Michigan, Minnesota, and Wisconsin states, we are able to study the impact that COVID-19 had on the U.S. upper Midwest region. We chose United States Steel, Morgan Stanley, UnitedHealth Group, and Enbridge Inc. to represent the Midwest region company stocks. Since the Midwest region is synonymous to agriculture, we analyzed the returns of commodities such as Corn, Soybean, Cheese, and Dairy (milk). Results show that during the pandemic, overall the agricultural commodities were not as volatile as the financial/industrial stocks. The stocks associated to Michigan had more negative responses while stocks related to Minnesota had positive responses. The data did signal overreactions and market corrections as COVID-19 evolved and governments began to better respond to it. Many of the stocks and commodities reacted initially negatively to most of the events, such as, WHO declaration, lockdown, peacetime emergency as well as rising number of infection cases and deaths. However, with more vaccination and second and third stimulus packages we find positive returns to most stocks and commodities. This is the period when bans and restrictions began to be lifted and the public began to feel a sense of optimism. Our study is limited to three Midwest states and ten relevant stocks and commodities. Future research can include more Midwest states of the U.S. and more companies to get a better representation of the consumers and the investors and thereby, an accurate impact of COVID-19 on a regional scale.

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