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Balance Sheet Strength: A Retrospective Analysis of Corporate Liquidity and Solvency and Firm Stock Returns

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Abstract

The onset COVID-19 Pandemic caused rippling effects throughout the global economy. Social distancing and stay at home orders shifted consumer demand, as the firmwide impact of these same policies led to supply chain shortages. The COVID-19 Pandemic induced a recession in 2020 that was unique from all others in US history. Throughout the beginning months of the Pandemic, firms rushed to raise debt, equity, and lines of credit, as public financing markets experienced increased volatility. How did the markets adapt to this sudden change? I examine the effect on stock returns of firmwide Balance Sheet strength as it changed throughout the Pandemic. Results indicate that firms with stronger Balance Sheets were better equipped to deal with these unexpected exogenous shocks and were rewarded with better stock returns. Balance sheet strength in the short term (liquidity) and the long term (solvency) were significant positive indicators of stock market return in 2020 Quarter 1. In later quarters, firms with more short-term liquidity had lower returns, which was explained by the opportunity cost of investing in liquid assets.

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I.   Introduction

The COVID-19 global Pandemic marked the second largest economy wide recession of the century. Along with the COVID-19 disease came stay at home orders and social distancing policies which caused global supply chain shortages and changes in consumer demand. Many businesses were forced to a halt due to these social distancing policies while others had to shut down production lines. Overall, the demand and supply shocks driven by the COVID-19 Pandemic caused a sudden drop in revenue for many US businesses. 2006 to 2014 Federal Reserve chair Ben Bernanke stated that the economic recession in 2020 was different in that it was caused by a viral outbreak as opposed to financial imbalances (Bernanke 2020).

In the first five months of 2020, the S&P 500 dropped 34% from its high to low. This came with increased volatility in many industries, as the standard deviation of weekly stock returns in the U.S. manufacturing industry went to 20% (Ding et al). In addition, the U.S. unemployment rate jumped from 3.6% to 10.1% from January 2020 to July 2020, as firms cut jobs to decrease expenses, and the US experienced a record drop in U.S. GDP during 2020 Q2 (Hotchkiss et al. 2020). The US government issued the CARES Act (The Coronavirus Aid, Relief, and Economic Security Act) to provide loans to small businesses and direct cash to adults making less than $75,000 per year to help stimulate the economy.

COVID-19 decreased future cash flows and increased debt refinancing risk, thereby exogenously increasing their default risk (He and Xiong 2012). This sent many firms into a "liquidity crisis", in which firms with more cash and less debt were better equipped to handle the shortfall. When looking at returns in the first two financial

quarters of the Pandemic, these financially flexible firms had higher market returns than their non-financially flexible competitors (Fahlenbrach et al 2020). However, the global COVID-19 Pandemic impacted businesses not only through the first quarters of 2020 but well into the future.

As cash flow decreased, firms had debts that had to be paid. It should be worthwhile to look into the effects of Balance sheet strength and how firms more equipped to pay off obligations fared during this time. Gryglewicz (2011) described corporate liquidity as a short-term characteristic that measures the ability of a firm to pay its obligations on time. There are various measures of Balance Sheet liquidity that analyze the ratio of liquid assets such as cash or investments to short term obligations. Corporate solvency is the ability to cover debt obligations in the long run. I find that both metrics are significant in predicting market returns in the first quarter of the COVID-19 Pandemic.

Many firms choose to hold cash reserves to buffer against adverse cash flow and liquidity shocks, whereas lines of credit are held to find future growth opportunities (Lins et al 2010). The beginning months of the Pandemic caused a liquidity crisis, as businesses were promptly shut down and firms struggled to pay off short term obligations. Acharya and Steffen (2020) found that firms with higher *off*-Balance-Sheet liquidity had significantly higher returns than those with lower liquidity profiles. I analyze the effects of *on*-Balance Sheet liquidity over the time period that I define as the height of exogenous risk. This time period, from 2020 Quarter 1 to 2021 Quarter 1, represents the span of the COVID-19 Pandemic in which vaccines were not available to all US adults. I believe exogenous risk decreased in April 2021, as vaccines then were

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available in every US state to all individuals over 18. My results show that off-Balance Sheet liquidity was only statistically significant in predicting returns for the first quarter of 2020.

The COVID-19 Pandemic serves as an interesting case study for our understanding of firm responses to external cash crises. The crisis was long lasting and had long-term impacts on consumer preferences. Many research papers focus on liquidity, particularly in the first few months of the Pandemic, and how well firms with better short term Balance Sheet strength performed. Overall, results overwhelmingly support those financial profiles with greater abilities to meet short term obligations had higher market returns.

Knowing that greater ability to meet short term obligations, or liquidity, correlates with returns, it makes sense to examine whether long-term ability, or solvency, has a similar effect. The COVID-19 Pandemic is very different from previous recessions because it exogenously changed the risk profile and future cash flows over multiple years with such short notice. Researchers should be interested in long term metrics such as corporate solvency, that measure a firm's ability to perform over this long term. How did firms that were better equipped to pay off long term obligations perform in the stock market in the face of an exogenous shocks? Did the market reward companies that had better long-term financial profiles better than those who did not?

In addition to the absence of study on solvency, or long-term Balance Sheet strength, there is little research relating to liquidity on the extended time period of the Pandemic. It is currently April 2022, and the United States is still experiencing repercussions of the Pandemic, such as masking and social distancing. Did investors

continue to value liquidity over the entire course of the Pandemic? Or did investors

assume COVID-19 would not last as long as it has? Perhaps investors will continue to

price companies at a premium in a time of increased risk and uncertainty. In this paper, I

analyze both short term and long-term metrics of Balance Sheet strength and how they

affected firmwide stock returns throughout the course of the COVID-19 Pandemic. I

focus on corporate liquidity and solvency ratios, to determine how well a firm can pay off

its obligations over differing time periods.

In this paper, I analyze many different types of ratios to represent short term

(liquidity) and long term (solvency) Balance Sheet strength throughout the Pandemic. I

look at the quick ratio (1) to examine short term Balance Sheet strength, and the debt-to-

assets ratio (2) to examine intermediate to long term Balance Sheet strength[1]. I ran

regression analyses testing the effect of these financial metrics on stock market returns

the following quarter, including various control variables such as equity beta,

profitability, firm size, etc. I examine how these independent variables change in

magnitude and significance over the course of the COVID-19 Pandemic, ultimately

finding that liquidity and solvency had significant positive effects on returns only in the

first quarter of 2020. I discuss potential reasons for why this holds true, and why these

reasons have lasting implications for company executives and policymakers. Ultimately,

my results show that holding longer term assets can be an additional hedge for exogenous

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[1] I would have liked to analyze other off Balance sheet measures of firm financial strength, such as credit drawdowns, but unfortunately I was not able to attain this information as a CMC student. As a result, my data focusses less on the immediate short term, and analyzes Balance Sheet return in the more intermediate to long term lense.

cash shocks, amending the conventional theory that cash and liquid assets were the main way to hedge.

The paper proceeds as follows. First, I analyze the current literature on corporate Balance Sheet strength prior to and during the Pandemic. I assess the currently existing studies on Balance Sheet strength as a predictor of market returns, and the research that has been done on the COVID-19 Pandemic. I then discuss my sources of data and the variables I am using. My Empirical section includes the econometric tests I will be ran and the regression framework that I employed. My results section discusses the findings of my tests, and the impacts of the significance. The Discussion section further dives into why my results show what they show, and what this means for company executives and future researchers. In my conclusion, I explore the implications of my findings and their addition to the existing literature.

My paper relates to the literature on liquidity and the use of financial ratios to determine Balance Sheet strength. Gopalan et al (2012) noted that Balance Sheet liquidity assesses the ability of a company to pay off its short-term debts using cash and other assets. Doina and Mircea (2008) looked at Balance Sheet strength, using solvency, or a company's ability to cover its longer-term obligations. In addition, they also defined liquidity as the capacity of the company to meet its short-term obligations and to ensure a security reserve for unpredicted events. Horobet et al (2021) found that there was a negative correlation between a firm's liquidity risk and *insolvency* risk: that firms have either more short-term or long-term debt. When analyzing firm bankruptcies, Amoa-Gyarteng (2021) found a statistically significant relationship between firm solvency and financial distress. The COVID-19 Pandemic was an economy-wide disruption, which increased the solvency risk profiles for all firms (Mirza et al 2020). This paper investigates how this exogenous change in risk affected firmwide stock returns. I find that Balance Sheet strength was a significant predictor of market returns, especially when there was increased uncertainty caused by the COVID-19 Pandemic (see *Table 4* and *Table 6*).

My paper explores areas regarding the effect of the COVID-19 Pandemic on the stock market. Ding et al. (2021) and Ramelli and Wagner (2020) studied stock price reactions during the Pandemic. They found that stock price reactions during the time period of January 2020 through May 2020 were determined by a combination of factors including financial profiles (cash and debt), business exposure to areas with high COVID-19 cases, and corporate social responsibility. Stocks experienced less of a drop if

they had stronger pre-Pandemic profiles, which they defined as more cash and undrawn credit lines, less total and short-term debt, and larger profits. My results complement this, showing that financial profiles with more assets relative to liabilities performed better than those which did not in 2020 Q1. I show that not only did short-term debt relative to short-term assets matter, but also that total debt relative to total assets mattered. Haque (2021) looked at leverage during the Pandemic and found that there was in fact a decrease in firm leverage due to COVID-19 lockdowns as firms risk profiles changed and therefore optimal leverage changed. The COVID-19 Pandemic reduced growth prospects and increased risk for many firms. I assessed how this leverage changed debt and liability levels, and how the market responded to this.

Lastly, my paper contributes to the COVID-19 literature on the "dash for cash". Acharya and Steffen (2020) studied the "dash for cash": that is, how non-financial firms' offset decreases in cash flow by increasing credit lines or turning to external financial markets. They looked at the changes in financing throughout the first quarter of 2020 separating companies by credit rating, analyzing credit drawdowns and changes in cash levels. Their study found that firms that were on the verge of being downgraded to non-investment grade drew down more cash and relied heavily on credit lines as opposed to public financial markets. This was a result of the potential increased cost of borrowing by being downgraded to non-investment grade: firms sought all available cash to avoid this jump in financing costs.

In addition, Archarya and Steffen (2020) look at differences in stock returns based on the ex-ante liquidity levels, or liquidity levels prior to the Pandemic. The study analyzed "Off-Balance Sheet" corporate liquidity, which includes drawn and undrawn

credit lines, and found that there was a positive relationship between this type of firm

liquidity and stock returns. Acharya and Steffen (2020) focus mainly on the first quarter

of 2020, which is just the first part of the Pandemic. I expanded on their data and analysis

throughout the next year, until April 2021, when vaccines became available to all adults

in the United States. My results relating to on-Balance Sheet measures of liquidity and

solvency have similar results as their findings, showing statistical significance throughout

the first quarter of the Pandemic.

III.   Data

The purpose of this analysis is to determine the effect of Balance Sheet strength on stock market performance during the COVID-19 Pandemic. I have decided to focus on the strength of the financial profile and the firm's Balance Sheet strength as it evolved through the Pandemic. Firms with stronger liquidity and solvency profiles (less debt in relative to assets) would in theory perform better than firms that didn't due to the increased financial flexibility of less obligations. I look at how a firm's financial strength in one quarter affected its stock market returns in the next quarter.

I have gathered Balance Sheet data on US non-financial firms and utilities firms with less than $100bn in assets from the S&P Compustat database. I analyzed various metrics such as quick ratio and the debt-to-assets ratio. In theory, I would very much liked to analyze credit revolvers and firm credit lines, but unfortunately these data were not available to me as a student. I have selected measures that show firms on Balance Sheet liquidity and solvency, or their ability to pay off short term, intermediate term, and long-term obligations.

Table 1 shows a list of financial variables and their definitions:

Table 1: List of Variable Names and Definitions

Independent and Dependent Variables

Liquidity   Balance Sheet Liquidity measured using the Quick Ratio

Solvency   Balance Sheet Solvency measured using the Debt-to-Assets Ratio

Returns   Quarterly Stock Returns

Controls

Firm Size   Equity Market value of shares outstanding

Beta   Measure of stock volatility

Momentum   Prior period stock returns

Profitability   Measure of firm profitability using the Gross Margin

Appendix *Table A.1* shows a full list of variable definitions.

Previous research has usen multiple different metrics to represent liquidity and solvency, such as the quick ratio, current ratio, equity ratio, interest coverage ratio, or the debt-to-equity ratio. Generally, there is a high correlation among these ratios (*Table 2*). Because of this, I have chosen to only look at the quick ratio and the debt-to-assets ratio. I believe that these two ratios specifically analyze Balance Sheet strength as it pertains to a firm's ability to pay off its obligations.

The quick ratio shows short term Balance Sheet liquidity:

$$(1) \ Quick \ Ratio = \frac{Current \ Assets - Inventories}{Current \ Liabilities}$$

The debt-to-assets ratio shows intermediate to long term Balance Sheet solvency:

$$(2) \ Debt \ to \ Assets \ Ratio = \frac{Short \ Term \ + \ Long \ Term \ Debt}{Total \ Assets}$$

Table 2: Correlation Matrix of Different Liquidity Measures

	Current Ratio	Quick Ratio	Cash Ratio
Current Ratio	1		
Quick Ratio	0.9873	1	
Cash Ratio	0.9714	0.9898	1

In addition to financial statement data, I have acquired monthly returns from the WRDS CRSP database. I have combined this with the financial data and have calculated quarterly returns. I have gathered data from 2020 Quarter 1 through 2021 Quarter 1. *Table 3* shows summary statistics for these variables.

Table 3: Summary Statistics Across All Time Periods

	Count (N)	Mean	Standard Deviation	Min	Max
Debt-to-Assets Ratio	7328	.332	.247	0	3.165
Current Ratio	7638	2.621	3.865	.250	127.223
Quarter Returns	7638	-.091	.380	-9.075	.909
Firm Size	7635	23240.04	115247.9	7.561	2901645
Equity Beta	7523	1.338	.694	-.498	6.317
Gross Margin	7640	0.474	0.210	-9.468	0.996

This paper uses many statistical models to show the effect of Balance Sheet strength on US stock returns throughout the Pandemic. I acquired quarterly financial data and monthly returns data on US nonfinancial firms and utilities firms from the Russell 3000 using the WRDS CRSP, Compustat, and Beta databases. I only included firms that have public returns data from 2019 Q2 to 2021 Q4, which comprises of 955 firms. I focus my analysis on the time from 2020 Q1 to 2021 Q1, but I have financial data from before 2020 Q1 to analyze stock price momentum, pre-Pandemic Balance Sheet strength. As I had quarterly financial data and monthly returns data, I chose to convert monthly returns to quarterly. To do this, I used the formula to convert multiple period discrete returns into one:

$$(1)\ PE_d(0,T) = \prod_0^{T-1}\big(1 + PE_d(t, t+1)\big) - 1$$

I have assumed that stock returns are discrete, where the quarterly performance is based on multiplied values. I can do this because I have monthly returns, at a single point in time. Thus, I treat these ending monthly values as beginning investments for the next period. In this equation, *PE* represents stock performance, as a decimal point, *T* is the calendar quarter, and *t* is the month (1, 2 or 3). With this formula, I have converted monthly returns to quarterly returns.

After converting monthly returns to quarterly returns, I used this returns variable as the dependent variable in relating solvency and liquidity profiles. I have used these

financial ratios as a predictor for stock market returns throughout the COVID-19

Pandemic, using the OLS regression framework.

I investigate the effects of liquidity on market performance throughout the

COVID-19 Pandemic. I have used the quick ratio as be a metric of liquidity and ability to

pay off short term debt. I test empirically the effects of liquidity on stock market returns,

using a similar OLS framework as that modeled by Acharya and Steffen (2020):

$$(2)\ r_{i,t} = \alpha_i + \gamma * \left(Liquidity_{i,t-1}\right) + \beta_1 Y_{i,t} + \epsilon_{i,t} + \beta_2 * D_{i,t} * \left(Liquidity_{i,t-1}\right)$$

Where r is a firm's quarterly stock return, α represents the constant, $Liquidity$ is the

financial ratio that I use to show firm liquidity (quick ratio), γ is a vector of control

variables that have been shown to affect firmwide stock returns (Firm size, Previous

quarter returns, Equity Beta, Profitability), and D represents a vector of dummy variables

for each time period (For the dummy variable D created for 2020Q1, $D_{i,2020Q1} = 1$,

$D_{i,2020Q2} = 0$, etc.). The subscript i represents the ith observation whereas the subscript t

represents the time period (year and Quarter).

I also investigate the effects of solvency on market performance throughout the

COVID-19 Pandemic. I use the debt-to-assets ratio as a metric for intermediate to long

term Balance sheet Strength. I have used a similar set of metrics for modeling returns

from solvency ratios as I did with liquidity:

$$(3)\ r_{i,t} = \alpha + \gamma * \left(Solvency_{i,t-1}\right) + \beta Y_{i,t} + \epsilon_{i,t}$$

Where r is a firm's quarterly stock return, $Solvency$ is the financial ratio that I use to show firm solvency (debt-to-assets,), γ is a vector of control variables that have been shown to affect firmwide stock returns (Firm size, Previous quarter returns, Equity Beta, Profitability), and D represents a vector of dummy variables for each time period (For the dummy variable D created for 2020Q1, $D_{i,2020Q1} = 1$, $D_{i,2020Q2} = 0$, etc). The subscript i represents the ith observation whereas the subscript t represents the time period (year and Quarter).

I measure Liquidity and Solvency independently as a predictor for stock returns. use a time-series panel regression to show the effect of these variables throughout the entire Pandemic period. In addition, I use a time-series panel regression with interaction terms to show the changes of these variables throughout each quarter. To analyze the effect of Liquidity and Solvency over each period, I test for significance using the following structure:

(4) H_0: $B_1 + B_k = 0$

I have created a vector of interaction terms (Liquidity*2020Q2, Liquidity*2020Q3, etc.) that multiply the firm liquidity or solvency values by the yearly dummy variables (2020Q2=1 if the period is Quarter 2 of 2020). In this framework B_1, represents the coefficient of Liquidity or Solvency (the effect of Liquidity or Solvency on returns in 2020 quarter 1), and B_k represents the effect of a future period interaction term (2020 quarter 2, 2020 quarter 3, etc.). Using the coefficients of these created interaction

variables, this Wald test shows the magnitude and significance of the change in the effect

of the liquidity and solvency ratios on stock returns over each quarter.

V.   Results

Table 4 column 1 shows the regression output for the framework outlined above. I have included all independent and control variables as they pertain to corporate liquidity throughout the time period of the Pandemic. This regression includes 5 quarters for 955 firms.

Table 4: Liquidity on Stock Returns From 2020Q1 through 2021Q1

VARIABLES	(1) Overall	(2) Quarter by Quarter
Liquidity	-0.000	0.005*
	(0.001)	(0.003)
Ln(Firm Size)	0.016***	0.016***
	(0.002)	(0.002)
Momentum	-0.001	0.002
	(0.022)	(0.023)
Equity Beta	0.111***	0.110***
	(0.011)	(0.011)
Profitability	0.000	0.000
	(0.000)	(0.000)
Liquidity*2020Q2		-0.007
		(0.006)
Liquidity*2020Q3		-0.013***
		(0.004)
Liquidity*2020Q4		-0.008
		(0.005)
Liquidity*2021Q1		-0.018**
		(0.008)
Constant	-0.330***	-0.339***
	(0.026)	(0.026)
Observations	7,413	7,413
Number of Companies	941	941
Firm-fixed Effects	NO	NO
Time-fixed Effects	YES	YES
R-sq Between	0.088	0.092
R-sq Overall	0.229	0.231

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Significance Test for 2020 Q2 through 2021 Q1

(1) H_0: Liquidity + Liquidity*2020Q2 = 0   (2) H_0: Liquidity + Liquidity*2020Q3 = 0

       chi2(1) = 0.10   chi2(1) = 6.76
      Prob > chi2 = 0.7570   Prob > chi2 = 0.0093

(3) H_0: Liquidity + Liquidity*2020Q4 = 0   (4) H_0: Liquidity + Liquidity*2021Q1 = 0

       chi2(1) = 0.68   chi2(1) = 4.59
      Prob > chi2 = 0.4107   Prob > chi2 = 0.0321

Table 4 models the returns for the entire Pandemic period as based on firm liquidity profiles. The variables Firm Size, Momentum, Beta and Profitability represent control variables from the asset pricing model. In the regression analysis, momentum, firm size, equity beta, and profitability are significant predictors of stock returns.

Table 4 column 1 shows a linear regression with the various control variables that were outlined above. In this regression, we can see that there is no significance for liquidity as a predictor of stock returns. Initially, one might think that this disproves Archarya and Steffen (2020) and goes against other literature stating that firm financial flexibility was a significant predictor of returns during the COVID-19 Pandemic. However, this regression analysis looks at liquidity over the entire period of the COVID-19 Pandemic. A lot of research has been done on the beginning, or the impact of liquidity on stock returns in the first few months of the Pandemic.

Table 4 column 2 shows my regression analysis on a quarter-by-quarter basis. The coefficient on the variable "Liquidity" shows the effect of Liquidity profiles in specifically 2020 Q1, which is positively significant at the $p < 0.1$ level. Firms that had a

1-point higher current ratio had a 0.5 percentage point increase in quarter stock returns. This is significant and impactful: firms with a 1-point higher quick ratio had a 2-percentage point increase in returns over the course of the entire next year.

Table 5 shows a Wald test for significance, which adds to the results from *Table 4 column 2*. As mentioned above, the regression analysis employed in *Table 4 column 2* only shows how the values for liquidity change over time. The Wald test for significance shown in *Table 5* shows the significance of 2 coefficients being summed, showing the statistical significance of these liquidity values at other quarters throughout the COVID-19 Pandemic (2020 Quarter 2 through 2021 Quarter 1). This test shows that in 2020 Q3 and 2021 Q1, liquidity was a significantly negative predictor of stock returns. This is quite interesting, as one may think that the exogenous changes in risk caused by the Pandemic may have caused investors to value a firm's ability to pay off its short-term obligations in a positive manner. However, results show quite the opposite. One potential reason for this is the opportunity cost of investing in liquid assets. By holding more current assets, a firm forgoes the opportunity to invest in longer term, higher returning assets. These types of firms may have been relying too heavily on the short-term future, rather than adjusting to the long-term changes that the COVID-19 Pandemic induced.

My empirical results show that firms with better *on*-Balance Sheet liquidity profiles (more current assets in relative to current liabilities) were rewarded with higher market returns in the first quarter of 2020. This is consistent with Archarya and Steffen (2020) who found that *off*-Balance Sheet liquidity was a significant measure of firmwide stock returns in various months at the start of the Pandemic (February and March of 2020). However, this effect is reversed in the following months beyond 2020 Q1. This is

because firms faced an opportunity cost for the value of liquidity- firms that invested

more in current assets were not able to invest in longer term, higher returning projects. As

a result, investors were not as confident in their adaption to the change in consumer

demand caused by the COVID-19 Pandemic.

Table 6: Solvency on Stock Returns From 2020Q1 through 2021Q1

VARIABLES	(1) Overall	(2) Quarter by Quarter
Solvency	-0.021	-0.086**
	(0.021)	(0.036)
Ln(Firm Size)	0.017***	0.017***
	(0.002)	(0.002)
Momentum	0.001	0.001
	(0.022)	(0.022)
Equity Beta	0.115***	0.114***
	(0.012)	(0.012)
Profitability	-0.000	0.000
	(0.000)	(0.000)
Solvency*2020Q2		0.108
		(0.086)
Solvency*2020Q3		0.121**
		(0.057)
Solvency*2020Q4		0.132*
		(0.073)
Solvency*2021Q1		0.176**
		(0.076)
Constant	-0.340***	-0.317***
	(0.027)	(0.028)
Observations	7,221	7,221
Number of Companies	943	943
Firm-fixed Effects	NO	NO
Time-fixed Effects	YES	YES
R-sq Between	0.198	0.200
R-sq Overall	0.231	0.233

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 7: Wald Test for Significance for 2020Q2 through 2021Q1

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(1) H_0: Solvency + Solvency*2020Q2 = 0   (2) H_0: Solvency + Solvency*2020Q3 = 0

chi2(1) =   0.09   chi2(1) =   0.56
Prob > chi2 =   0.7587   Prob > chi2 =   0.4548

(3) H_0: Solvency + Solvency*2020Q4 = 0   (4) H_0: Solvency + Solvency*2021Q1 = 0

chi2(1) =   0.75   chi2(1) =   2.15
Prob > chi2 =   0.3857   Prob > chi2 =   0.1421

Table 6 models the returns for the entire Pandemic period as based on firm solvency profiles. The variables Firm Size, Momentum, Beta and Profitability represent control variables from the asset pricing model. In the regression analysis, firm size, and equity beta are significant predictors of stock returns.

Table 6 column 1 shows that corporate solvency profiles were not significant predictors of market returns throughout the entire Pandemic time period. This is similar to the results that were found with liquidity in *Table 4*, as this regression shows a lack of significance over the entire period. Similar to liquidity, however, solvency can also be significant at certain points in time. *Table 6 column 2* shows the regression analysis for solvency on a quarter- by-quarter basis. The coefficient on the variable "Solvency" in *Table 6 column 2* shows the effect of the debt-to-asset ratio on returns in specifically 2020 Q1, which is negatively significant at the $p<0.05$ level. Firms that had a 0.1-point lower debt-to-assets ratio had a 0.8 percentage point increase in quarter stock returns.

This is significant and impactful: firms were more solvent with a 0.1-point lower debt-to-assets ratio had a 3.2-percentage point increase in returns over the entire next year.

Table 7 shows a Wald test for significance, which adds to the results from *Table 6 column 2*. Like the regression I ran for Liquidity, the regression analysis employed in *Table 4 column 2* only shows how the values for Solvency change over time. *Table 7* shows us the statistical significance of these solvency values at other quarters throughout the COVID-19 Pandemic (2020 Q2 thorugh 2021 Q1). This test shows that solvency was not a significant predictor of stock returns throughout any other time-period.

Similar to the effect of liquidity profiles on stock returns, firms with better solvency profiles were only rewarded with better returns in the first quarter of 2020. Different from the effect of liquidity profiles, however, there is not a time period where better solvency profiles had a significant negative effect on returns. This would make sense in the framework of my prior argument on why more liquid firms had lower returns in certain quarters following 2020 quarter 1. I argued earlier that more liquid firms had forgone investments in longer term, higher returning investments and therefore had lower returns. In the case of solvency, it would make sense why this has no effect- the debt-to-assets ratio that I am analyzing encompasses *all* assets, both the short term, perhaps lower returning ones, as well as the long, higher returning assets.

My empirical results show that firms with better *on*-Balance Sheet solvency profiles were rewarded with higher market returns in the first quarter of 2020. This aligns with my previous analysis on liquidity profiles, which showed that firms with better financial flexibility had significantly higher returns in the first quarter of 2020. In addition, this is also consistent with Archarya and Steffen (2020) who found that *off-*

Balance Sheet liquidity was a significant measure of firmwide stock returns in various months at the start of the Pandemic (February and March of 2020). My regression analysis shows that solvency was not a significant predictor of market returns beyond 2020 quarter 1. The COVID-19 Pandemic was an exogenous change in the risk profiles of all companies. Investors considered this change at the onset of the pandemic, valuing securities differently dependent on their Balance Sheet strength. Beyond the first quarter, investors had already priced in the change in risk brought by COVID-19. Solvency was not a significant predictor of returns beyond 2020 quarter 1 because it was already priced into the value of the securities from the onset of the Pandemic.

VI.   Discussion

I tested the effect of Balance Sheet strength on stock market returns over the time period of what I define as the highest risk during the COVID-19 Pandemic. My empirical results show that Balance Sheet strength was a significant predictor of stock market returns in the first quarter of 2020. Companies that were more equipped to meet short- and long-term obligations were rewarded with higher stock market returns during the first period of the Pandemic. This fits in with previous research and our understanding of the exogenous risks of the COVID-19 Pandemic. Along with the COVID-19 disease came state sanctioned lockdowns and social distancing policies that greatly changed the revenues of all firms. However, these firms had obligations that had to be met. Firms that had better solvency and liquidity profiles, were seen as more desirable by investors because they were better able to pay off these obligations even as revenue streams greatly decreased.

My results show that solvency was not a significant predictor of market returns beyond 2020 quarter 1. I attribute this to the fact that the additional risk posed by the COVID-19 Pandemic was already priced in by the decrease in 2020 quarter 1. These firms with higher debt-to-asset and lower quick ratios had a greater decrease in returns than other firms. Therefore, their stock prices were already representative of the added risk that they would default. My results also show a negative statistically significant relationship between the quick ratio and returns in 2020 Quarter 3 and 2021 Quarter 1. The explanation I posed earlier was that this can be attributed to firms facing an opportunity cost of holding more liquid assets. Perhaps more liquid assets had lower

returns, and therefore more liquid firms did not experience the same rise in share prices as less liquid. What is perplexing, however, is that this significance only remained in 2 out of the 4 quarters. Appendix *Figure A.2* shows the 7-day average COVID-19 cases over the course of the Pandemic. As seen, the two largest "spikes" in cases during the time period I analyzed occur in these same quarters, 2020 Q3 and 2021 Q4. Perhaps during these quarters, the increases in COVID-19 cases caused investors became more conscious about longer term financial strength, and how these companies would handle shutdowns and other policies in the long term.

These findings have implications for company executives. Executives should remain wary of the use of debt and liabilities in relation to their total value of assets, as to keep default risk low and protect against exogenous shocks. This balance sheet strength served as one measure of default risk, and my results show that investors significantly valued this at the start of the COVID-19 Pandemic. Companies with excessive obligations additional financial burdens that they had to deal with in addition to the changes in revenue that came during the Pandemic. I have shown that it is important for executives to maintain a healthy balance sheet, limiting the scope of their liabilities to remain financially flexible. My results also have implications for asset profiles in firms.

As previous research has also shown, holding short term assets and cash are good hedges for exogenous cash flow shocks. I find that this remained true during the COVID-19 Pandemic, as firms with higher liquidity levels had higher returns in 2020 Q1. In addition, I find that solvency, a longer-term metric of financial strength, was also a significant hedge for these exogenous shocks. My results also show that, unlike short-term liquidity assets, holding more long-term assets did not have a negative effect on

returns in the quarters following 2020 Q1. Many firms look specifically to cash and other short-term assets to hedge against future shocks, overlooking the advantages of other assets. These other long-term assets may be just as important to protect against these shocks. Better solvency profiles were not only significantly positive in the first quarter of 2020, but they were also never significantly negative. There was no harm to holding long term, less liquid assets. Rather than holding more short-term, liquid assets as a hedge for exogenous shocks, company executives should also consider the benefits of holding longer, higher returning assets as the hedge.

Although my results regarding the time period significance of liquidity do in fact correlate with the case levels in the US, my analysis is very basic to determine what the actual reason is that returns were lower for more liquid firms. Further research should be done to examine what else is unique about these two quarters, and why firms with higher liquidity performed worse. What other reasons could there be as to explain why liquidity was not rewarded in a time of heightened uncertainty and risk? In addition, further research should be done to expand the time period on what Archarya and Steffen's (2020) study of off-Balance Sheet liquidity. It would be interesting to see if results would be similar to mine: if off-Balance Sheet liquidity has a negative relationship with stock returns in the quarters following 2020 Quarter 1.

There has been extensive research in the study of the COVID-19 Pandemic that relates to certain industries, and how they performed during this time period. Future research can expand on my market wide analysis and focus on specific industries. Was the effect of Balance Sheet strength on stock returns industry dependent? Did the ratios of those companies in industries that were affected most by lockdowns such as lodging and

have more significance on returns? What happens when you look at industries that

thrived, like technology. Were the returns of these companies still significantly affected

by the strength of their Balance Sheet?

VII.   Conclusion

The COVID-19 Pandemic was an exogenous shock that affected both the expected cash flows and risk profiles of all firms globally. In the US, social distancing policies and stay at home orders changed consumer demand. On the firm side, companies had to adapt to supply chain shortages and changes in demand. Firms rushed to issue debt and alter products to adapt to this exogenous change. There is significant evidence showing that firms with better Balance Sheet strength were able to adapt more financially and therefore had higher stock returns in the first quarter of 2020. This remains true in both short term and long-term metrics of Balance Sheet strength. When looking at firm liquidity profiles, a 1-point increase in the current ratio correlated with a significant 0.5 percentage point increase in stock returns over this first quarter. When looking at firm solvency profiles, I also found that a 0.1-point decrease in the debt-to-asset ratio correlated with a 0.8 percentage point increase in returns.

Throughout this time of enormous uncertainty, firms rushed to public markets to supplement their decrease in revenue, and investors, at the same time, had to decide which companies to invest in. Ultimately, they made the decision that firms with better liquidity and solvency profiles, those that could meet short-term and long-term obligations better, were seen as more favorable than those that could not. This did not last long, however. Investors chose what they favored in firms and decided that Balance Sheet strength was an indication of a firm's future financial position. Beyond 2020 Quarter 1, the added risk of these companies was already priced in. My results show that there was a negative effect of liquidity on market returns in the calendar quarters

following 2020 Q1. More liquid firms were holding lower risk, short term assets as a hedge against cash flow shocks, forgoing higher return projects.

Throughout this paper I analyzed the effect of firm Balance Sheet strength on market returns throughout the COVID-19 Pandemic. I theorized that firms with better liquidity and solvency profiles would be favored by investors throughout the entire time period of heightened risk. My empirical analysis found that this only held true during the first quarter of 2020. The exogenous changes in risk that COVID-19 brought along influenced investors to change their valuation of firms with different Balance Sheet profiles. Beyond 2020 Q1, this effect was negligible, it was already priced in. Liquidity and solvency did not have a positive effect on returns beyond this first quarter. My results showed that liquidity even had a *negative* effect on returns, to which I attributed to the opportunity cost of liquid assets.

My paper shows how *all* assets can be used to guard against cash flow shocks. It might even be more desirable for company executives to consider holding more long-term assets, as these companies will then not face the opportunity cost of liquidity. If policy makers are to give aid to these businesses, they should create covenants that ensure the investment of this capital and the paydown of obligations. My results conclude that Balance Sheet strength should be taken as a serious precaution, as in the event of an exogenous change in risk such as the COVID-19 Pandemic, investors will re value companies based on their ability to meet obligations.

VIII. References

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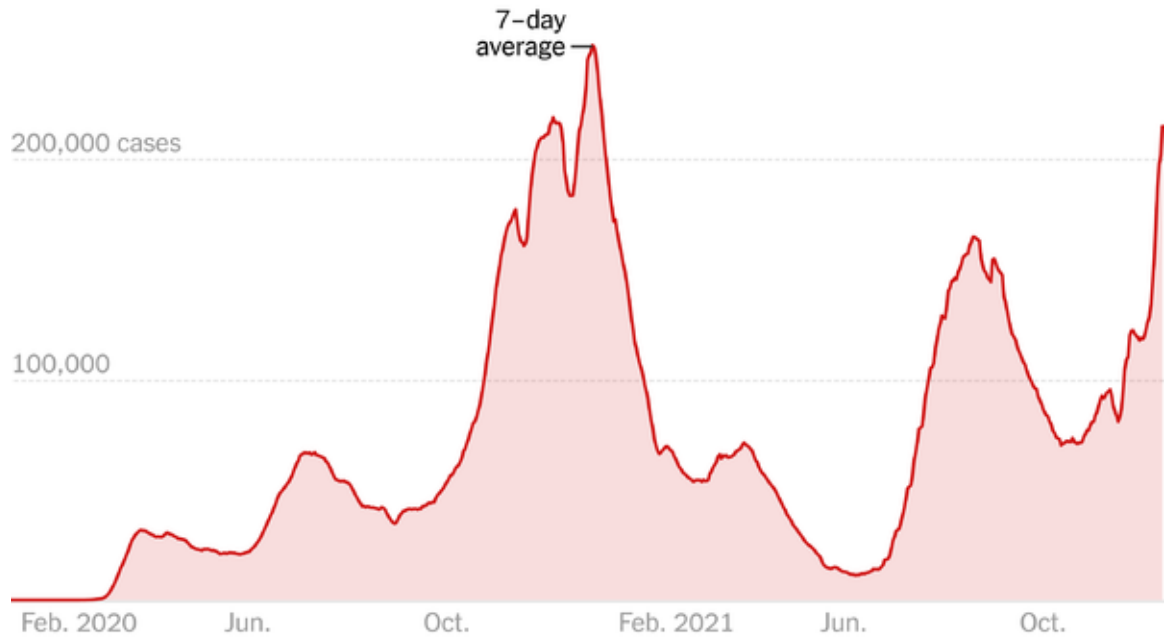
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IX. Appendix

Table A.1: Full List of Definitions

Liquidity	Balance Sheet Liquidity measured using the Current Ratio
Solvency	Balance Sheet Solvency measured using the Debt-to-Assets Ratio
Returns	Quarterly Stock Returns
Firm Size	Market value of shares outstanding
Equity Beta	Measure of stock volatility
Momentum	Prior period stock returns
Profitability	Measure of firm profitability using the Gross Margin
Gross Margin	Company profitability before deducting Selling, General, and Administration Expenditures
Line of Credit	Credit facility extended by banks for quick access to cash
Balance Sheet Liquidity	Measure of short-term financial strength
Solvency	Measure of long-term financial strength
Off-Balance Sheet Liquidity	Measure of short-term financial strength via the use of cash and lines of credit
Investment Grade	Bond Rating that signifies relatively low risk
Non-Investment Grade	Bond Rating that signifies high risk

Figure A.2: COVID-19 Cases From 2020-2021

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[2] Wolfe and Moser 2021