

Contagious Margin Calls: How COVID-19 threatened global stock market liquidity

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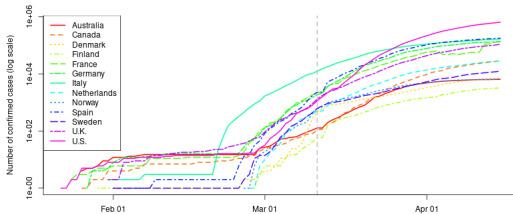
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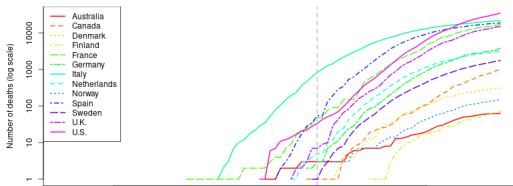
Overview

COVID-19 across the western world, Feb-Apr 2020

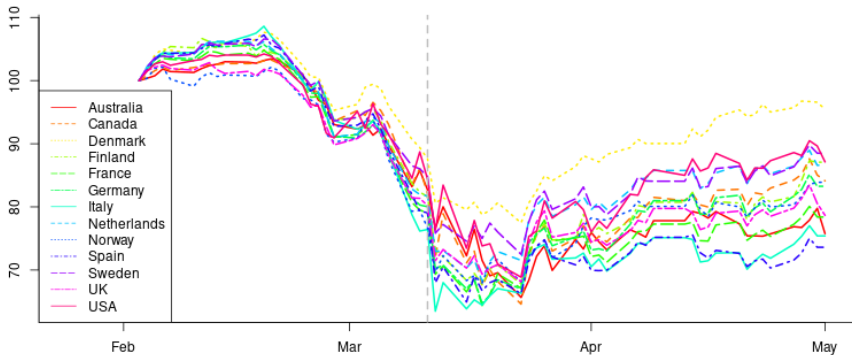
The evolution of confirmed cases (log scale)



The evolution of deaths (log scale)



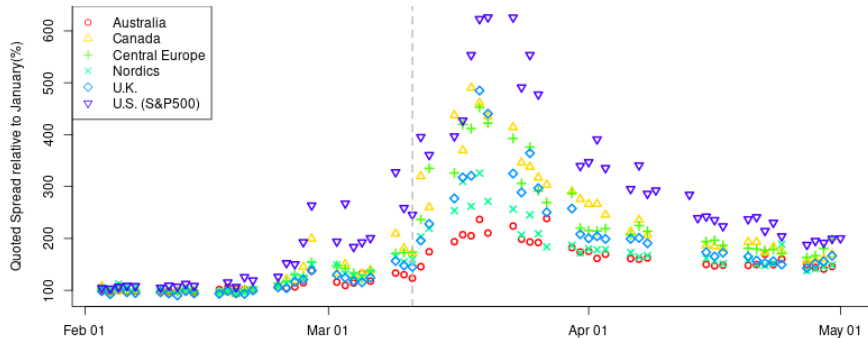
Stock Prices Fall, Feb-Apr 2020



Stock indices relative to level on February 1, 2020.

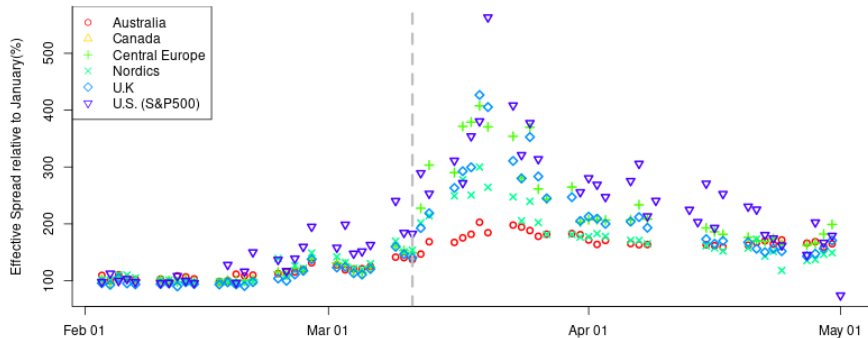
Liquidity evolution – Quoted Spreads – Feb–Apr

Quoted Spreads - Compared to January Average



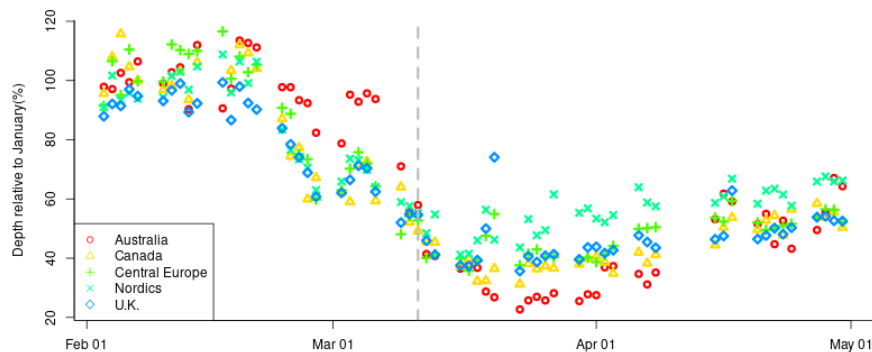
Liquidity evolution – Effective Spreads – Feb–Apr

Effective Spreads - Compared to January Average



Liquidity evolution – Depth – Feb–Apr

Depths - Compared to January Average



Why should equity liquidity worsen?

A fall in equity *values* need not lead to a fall in equity *liquidity*.
Research issue: What underlies the decline in liquidity?

- Is it something about the equity trading environment?

What has happened to the worlds equity markets recently?

- From manual markets to electronic limit order markets.
- Reliance on a few large “electronic liquidity providers” – (Virtu, Citadel, etc)

Background - Electronic Liquidity Providers

- Business Model:
 - “Earn the spread” — between buyers and sellers (Brokerage)
 - “Arbitrage” — look for differences across markets.
 - “Scale” — be a large player in many markets.
 - “Hedge” — e.g. use derivatives markets to offset risk in equity markets.
- Method: Electronic *High Frequency Trading*, ie. leave much of the decisions to *Algorithms*.
- Consequence: The world’s financial markets rely on a few large ELP’s to function.

Rumblings from the markets

“Given the sustained levels of extraordinary volatility in the current macro environment . . . we consider it prudent to opportunistically supplement our borrowing capacity.”

— Virtu Financial Press Release, March 20, 2020



Possible Mechanism: Liquidity Spirals



Higher Margin

- Lower Liquidity
- Higher Price Impact
- Falling Prices
- Higher Margin

Brunnermeier and Pedersen (2009)

Disentangling causes of liquidity worsening

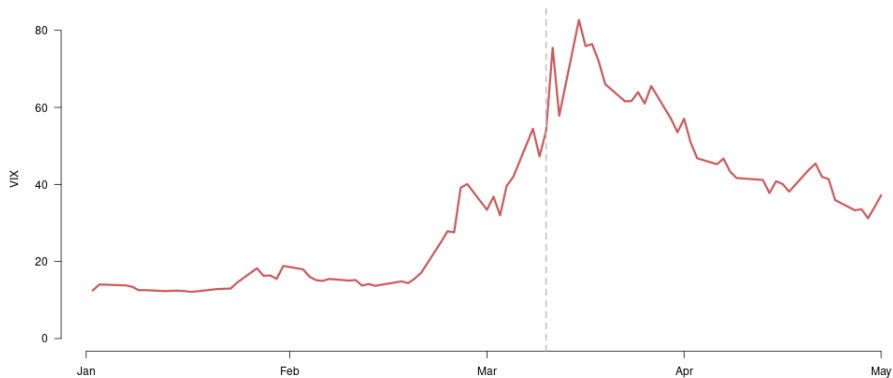
Empirical challenge: Distinguishing:

The Four Horse-persons of the Financial Apocalypse



- **Death** – The number of cases of COVID-19.
- **Pandemic** – WHO March 11 declaration of a Pandemic.
- **Fear** – Volatility increases – necessary to increase compensation to liquidity providers (bid/ask spread).
- **Regulation** Changes to regulatory costs for ELP
– *Margins* (Reserve assets).

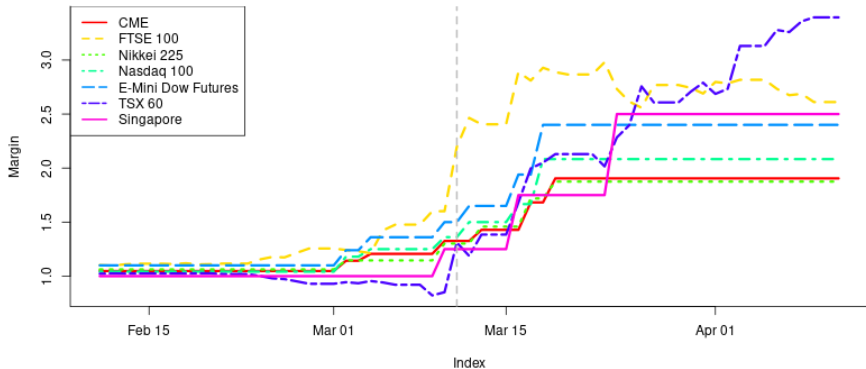
Fear - Evolution of VIX



or Stavanger

Regulation – margin requirements

Changes to margins for selected futures markets



Empirical analysis – explaining changes in liquidity

Explaining changes in liquidity by measures of

- Country-wide Covid infections (Death).
- WHO March 11 World-wide declaration of (Pandemic).
- Stock market volatility (Fear).
- Margins (Regulation)

Result: They all explain the worsening of liquidity.

Empirical analysis – explaining changes in liquidity

$$Liquidity_{i,t} = \alpha_0 + \beta_0 \text{Pandemic Variable}_t + \text{Controls}$$

<i>Dependent variable:</i>	Effective Spread			
	(1)	(2)	(3)	(4)
Realized Volatility	0.5*** (0.013)			
Pandemic		146.4*** (1.3)		
Covid-19 cases			18.642*** (0.2)	
Margin				0.009*** (0.0001)
Volume	11.832*** (0.8)	10.8*** (0.6)	6.4*** (0.7)	14.2*** (0.7)
Market Return	3.706*** (0.23)	0.02 (0.18)	0.45** (0.20)	-1.9*** (0.21)
Constant	-35.4*** (13.6)	-71.7*** (10.8)	-33.5*** (11.6)	-175.4*** (12.2)
Observations	17,353	19,214	19,214	18,755

Narrowing analysis: Is it margin?

Search for clearer evidence that margins are important

Two sub-analyses:

- Cross-sectional differences in ELP participation.
- Case: Same asset – different margins.

Cross-sectional differences in ELP participation

ELP most active in the largest stocks on the exchange.

- For trading, rely on index derivatives to hedge inventory risk.
- Arbitraging between equities and index derivatives market only relevant for equities in index.

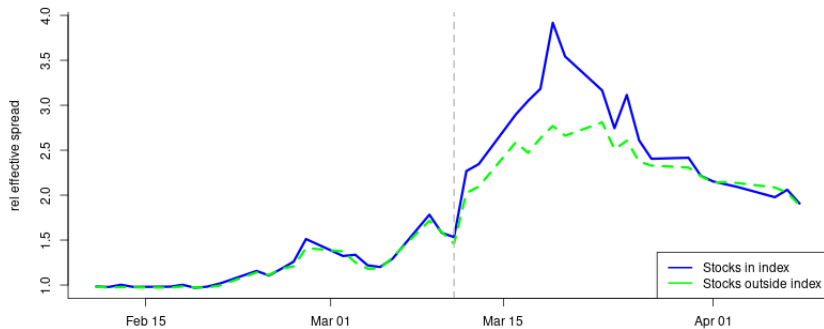
Crossectional prediction:

- ELP will be more active in equities in the main stock indices.

Suggest test:

Does liquidity worsen relatively *more* for stocks in index?

Comparing effective spread, index vs non-index shares



Diff-in-diff analysis, index vs non-index shares

<i>Dependent variable:</i>					
	Q.Spread (1)	Eff.Spread (2)	Real.Spread (3)	Pric.Impact (4)	Depth (5)
Pandemic	141.6*** (1.4)	125.4*** (1.2)	-437.2*** (142.6)	144.9*** (4.9)	-39.3*** (1.1)
Index Constituent	-3.8* (2.0)	-1.4 (1.7)	-114.4 (220.1)	14.1** (7.0)	-8.6*** (1.5)
Interaction	15.5*** (2.6)	14.3*** (2.1)	608.1** (293.7)	-7.1 (9.0)	3.5* (2.0)
Volume	3.3*** (0.5)	1.1*** (0.4)	160.6*** (43.0)	-16.0*** (1.6)	0.7** (0.4)
Market return	-1.4*** (0.2)	-0.9*** (0.1)	5.2 (16.7)	-0.5 (0.5)	0.3** (0.1)
Constant	67.8*** (7.4)	101.6*** (6.1)	-2,565.7*** (683.9)	388.6*** (25.4)	83.6*** (5.6)
Observations	39,790	39,816	19,002	39,816	39,790
Adjusted R ²	0.3	0.3	0.002	0.03	0.04
<i>Note:</i>	* p<0.1; ** p<0.05; *** p<0.01				

Case: One Asset – Two margins

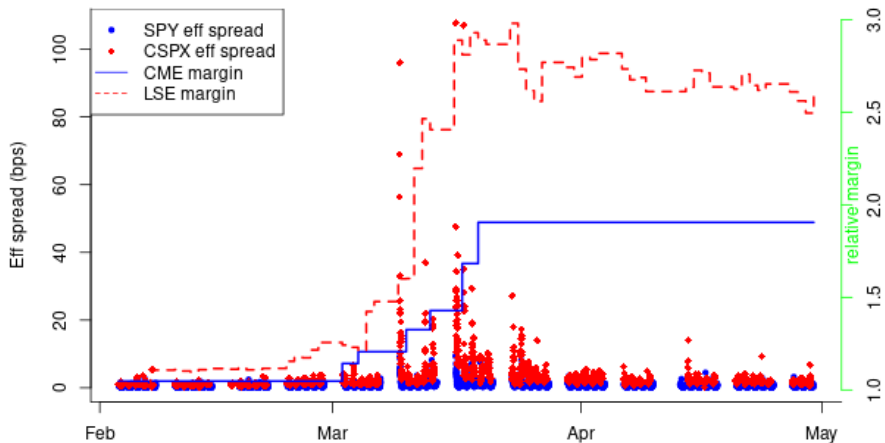
SPY: ETF tracking S&P 500.

Traded in US (SPY) and UK (CSPX.L).

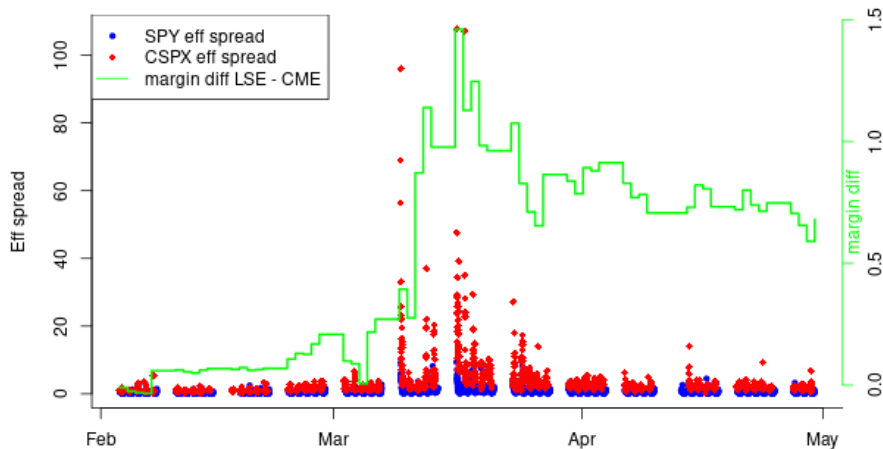
UK margins increase relative to US margins

→ What happens to liquidity in the two markets?

Liquidity of SPY (US) and CSPX (UK)



Liquidity of SPY (US) and CSPX (UK)



Liquidity of SPY (US) and CSPX (UK)

Difference-in-difference regression for ETFs tracking the S&P500 index

$$\text{Liquidity}_{i,t} = \alpha_0 + \beta_1 \text{LSE}_{i,t} + \beta_2 \text{Margin increase}_t + \beta_3 \text{LSE}_{i,t} \times \text{Margin increase}_t + \varepsilon_{i,t}$$

<i>Dependent variable:</i>	Quoted spread	Effective spread	Realized spread	Price impact
LSE	1.92 (1.80)	0.63 (0.77)	0.07 (0.77)	0.48 (0.36)
Margin increase	1.91 (1.80)	0.78 (0.77)	0.86 (0.77)	0.62* (0.36)
LSE x Margin increase	13.69*** (2.55)	5.73*** (1.08)	2.29** (1.08)	2.73*** (0.50)
Constant	1.01 (1.28)	0.39 (0.54)	0.28 (0.54)	0.20 (0.25)
Observations	160	160	160	160
Adjusted R^2	0.43	0.41	0.11	0.47

Conclusion

The pandemic induced a severe negative shock to equity market liquidity.

The liquidity shock was largest for the most liquid (index) stocks, which are also stocks with largest ELP (financial intermediaries) participation.

Comparing trading of SPY ETFs in UK vs US, liquidity worsens more when margin increases more.

→ Evidence for the role of *margins* in the functioning of equity markets.

Problem:

Higher Volatility
→ Higher margin
→ Lower liquidity
→ Exacerbates Volatility

Possible Policy Responses

- Adjust margins more predictably (slowly)
- Regulatory liquidity buffers triggered by price movement
- Emergency capital mechanisms have been used in banking

Data for country-wide analysis:

2020 Stock Market Quotes and Trades in:

- Australia
- Canada
- Scandinavia (Den, Fin, Nor, Swe)
- Large EU countries (Ger, Fra, Ita, Spa, UK)

Data for SPY analysis

Trading records for SPY (US) and (CSPX.L) (UK)

Data Source: Refinitiv

Data: Trades, Top of Limit Order Book

Are ELP's really withdrawing more from index stocks?

Index vs non-index analysis: Relies on ELP presence higher in index shares.

Order to Trade Ratio - Common measure of ELP presence

Sample:	<i>Dependent variable: Order to Trade ratio</i>					
	All	Australia	Canada	Norway	Sweden	U.K.
High margin	2.8*** (0.6)	-6.9*** (0.5)	-0.1 (1.7)	13.1*** (2.5)	-4.4*** (0.9)	25.6*** (1.3)
Index constituent	9.7*** (0.9)	2.6*** (0.8)	0.8 (3.2)	8.5*** (2.9)	7.0*** (1.2)	26.5*** (1.8)
High margin × Index constituent	-13.4*** (1.2)	-1.7 (1.1)	-12.6*** (3.7)	-9.6*** (3.4)	-4.9*** (1.6)	-39.1*** (2.0)
Volume	-7.3*** (0.2)	-3.2*** (0.1)	-3.1*** (0.6)	-12.4*** (1.0)	-10.6*** (0.3)	-13.0*** (0.5)
Index return	0.3*** (0.1)	0.05 (0.1)	0.5*** (0.2)	-0.6** (0.3)	-0.2* (0.1)	0.4*** (0.1)
Constant	221.7*** (3.3)	149.8*** (2.4)	164.2*** (9.8)	303.6*** (15.3)	278.1*** (5.4)	305.5*** (8.6)
Observations	39,816	9,932	10,973	1,866	7,327	9,718
Adjusted R^2	0.04	0.1	0.01	0.1	0.1	0.1

How does the Covid-19 crisis compare to 2008?

Effective spread

