Purpose and Caveats

This assessment considers the implications of COVID-19 for electric utility cost of capital in 12 countries.

- It draws upon the observations of two recent past Brattle assessments of COVID-19 effects on energy market demand and prices more generally.
- The pandemic continues to impose tragic personal losses on millions of persons and to have devastating effects on healthcare, education, business activity, and employment.
- Despite relaxed social distancing, there are meaningful concerns that there will be long term effects that could last well into 2021.
- Regulators face an acute near term challenge in protecting the current generation of customers already battered by the pandemic without gutting the ability of utilities to serve.
- In light of historically low interest rates, it is natural to ask whether utilities’ overall cost of capital has gone down in a way that could be passed through to customers.
- However, many heightened financial indicators suggest this would be vastly premature to conclude at present.
Agenda

1. Overview
2. Brief Comparison of COVID-19 in Various Countries
3. Global Financial Sector Impacts
4. U.S. Financial Sector Impacts
5. Country-Specific Details (Appendix)

Frame of reference: We have treated January 1, 2020, as the beginning of the significant influence of COVID-19 on the global economy.
Comparing and relating economic consequences of COVID-19 across countries is difficult, not least because the severity of outbreak can only be measured very imprecisely with reported infection and death rate statistics, either in total or per capita.

- Sometimes those are not similar within a country’s experience, depending on age of population, type and timing of response (lockdown, testing, etc.)
- E.g., although the U.S. has the highest amount of reported cumulative infections per 100K people, it falls in the midrange of other countries in terms of death rates, while some EU countries have low incidence but higher deaths per 100K people.

Likewise economic impacts are heterogeneous, depending on such factors as mix of industries, dependence on exports or tourism, and policies in place or introduced for economic relief.

- E.g., much of Europe has employment continuity policies in place, while the U.S. needed the Paycheck Protection Program stimulus to provide unemployment relief.
- The U.S. stock market has been surprisingly robust (esp. given the large COVID problem), likely due to its international prominence for equities, as well as its fortuitous hosting of several huge firms that have become more important during the pandemic.

Nonetheless, all the countries and financial markets we analyzed experienced some similar impacts:

- Decline in GDP (or GDP growth), mostly falling to -5 to -9% year-on-year by the end of Q1 2020.
- Stock markets almost all crashing by 25-35% in the first two weeks of March, but most have recovered at least half of the drop.
- Market volatilities mostly doubled or tripled.
- Government bond rates often spiked briefly in mid March but have mostly fallen by 10-60 bps or more by June relative to the beginning of the year.
Overview – Cost of Capital Impacts

Perhaps the most visible effect on Cost of Capital is the (mostly, not always) reduced government bond rates. In CAPM terms, this would lower the risk-free rate and might suggest a general reduction in CoC.

However, market volatilities being much higher would tend to push the other way, which is significantly confirmed in US data patterns:

- Utility stocks have become even more volatile than the market as a whole.
- All stocks have become more correlated with each other, recognizing the shared economic hardship.
- Utility betas measured with just 2020 daily data are roughly twice as high as in 2019 or prior years,
  - At or a bit above 1.0 vs. often .5-.75 in pre-COVID times.
  - True for electric, gas, and water utilities.
- Market risk premiums derived from monthly DCF evaluations are up about 1% in most countries (with a few declining, especially in the E.U.)

Net effect is that utility cost of equity is probably up.

There are structural reasons for why utility equities are more risky now and likely will remain so for a while, possibly a few years:

- Shut-off moratoriums for customers unable to pay bills will cause significant deferred costs.
- Significant risk of part of commercial customer base not recovering soon (or at all) from the lockdowns and new protocols.
- Short term data spikes are large enough to influence look-back measurements for a few years into the future.
Comparative COVID-19 Situation in Various Countries
Stabilizing but Still Growing

Worldwide, COVID incidence is still increasing, as the global death toll has reached over 500,000 as of June 28.²

• As of June 5, the worldwide rate of incidence reached a new high of more than 100,000/day over a 7-day average history.³

Most E.U. and East Asian countries have “flattened the curve” but less so in the U.S.

• Can be seen in curves at right, where slope indicates rate of doubling.

• U.S. infections’ and fatalities’ doubling rates have declined since April, but are still among the highest on a global scale.

Note: This analysis omits the Southern hemisphere.

Source: European CDC – Situation Update Worldwide – Last updated 28th June, 11:00 (London time)
Global Incidence Metrics

Out of the countries listed below, the U.S. has the largest COVID incidence, absolutely and (in this sample) per capita, while it falls in the midrange for fatality rate per 100K people.

- This is lower than many of the European countries (Spain, U.K., Italy, France, Sweden), but much higher than has been reported in early lockdown economies like in East Asia
- These metrics can be used as proxies for normalizing comparisons on how the infection has undermined the state of the economies.

**Cumulative Infections per 100,000 People**

- United Kingdom: 452
- Spain: 525
- Italy: 394
- Sweden: 550
- France: 284
- United States: 664
- Canada: 274
- Germany: 229
- Japan: 14
- South Korea: 24
- Australia: 30
- China: 6

**Cumulative Deaths per 100,000 People**

- United Kingdom: 64
- Spain: 58
- Italy: 57
- Sweden: 50
- France: 44
- United States: 36
- Canada: 23
- Germany: 11
- Japan: <1
- South Korea: <1
- Australia: <1
- China: <1

*Source: CNN, data as of June 18, 2020.*
Global Financial Sector Impacts
Yields on 10-year government bonds have generally been constant, with spikes in mid March except in China, South Korea, and Japan.

- China has had highest yields (averaging 2.7% in 2020) and Germany the lowest (averaging -0.4%).
- U.S. and Canadian yields have shown the highest declines since the beginning of the year (-1.1%).
- Germany, Sweden, France, and Japan had negative yields on their 10-year bonds to encourage consumer spending.
- Changes plausibly driven by monetary policy and quantitative easing.

Source: Bloomberg, data as of June 18, 2020.
Note: Decline in stock prices and bond yields shown as of June 15, 2020.
**Economic Indicators**

**Sovereign debt ratings remain largely unchanged.**
- Even countries that have been hit the hardest by the pandemic, e.g., U.S. and Spain, maintain AA+ and A credit ratings.
- Canada, however, has been recently downgraded by Fitch Ratings from AAA to AA+ due to “expanded general government deficit” and expectations of “higher public debt ratios”.6
- Countries with the lowest credit rating saw an increase in government bond yields.

**Inflation has decreased and unemployment has generally increased.**
- Canada, South Korea, Spain, and Italy experienced deflation in May.
- Canada and the U.S. have had the highest increases in job losses, with unemployment more than doubling and tripling between January and May.
- Most European countries have low unemployment, which has not changed much; likely due to policies on labor protections.

**Long Term Foreign Currency Debt Rating, Inflation, and Unemployment**

<table>
<thead>
<tr>
<th>Country</th>
<th>Change in 10Y Govt Bond Yield</th>
<th>LT Foreign Currency Debt Rating</th>
<th>Inflation (%)</th>
<th>Unemployment (%)</th>
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<tr>
<td></td>
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<td>Jan-20</td>
<td>May-20</td>
</tr>
<tr>
<td>U.S.</td>
<td>-1.1%</td>
<td>AA+</td>
<td>2.5%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Canada</td>
<td>-1.1%</td>
<td>AAA</td>
<td>2.4%</td>
<td>-0.4%</td>
</tr>
<tr>
<td>U.K.</td>
<td>-0.6%</td>
<td>AA</td>
<td>1.8%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Australia</td>
<td>-0.4%</td>
<td>AAA</td>
<td>1.8%*</td>
<td>2.2%*</td>
</tr>
<tr>
<td>China</td>
<td>-0.3%</td>
<td>A+</td>
<td>5.4%</td>
<td>2.4%</td>
</tr>
<tr>
<td>South Korea</td>
<td>-0.2%</td>
<td>AA</td>
<td>1.5%</td>
<td>-0.3%</td>
</tr>
<tr>
<td>Germany</td>
<td>-0.2%</td>
<td>AAA</td>
<td>1.7%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Sweden</td>
<td>-0.1%</td>
<td>AAA</td>
<td>1.3%</td>
<td>0.0%</td>
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<tr>
<td>France</td>
<td>-0.1%</td>
<td>Aa</td>
<td>1.5%</td>
<td>0.4%</td>
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<tr>
<td>Spain</td>
<td>0.2%</td>
<td>A</td>
<td>1.1%</td>
<td>-0.9%</td>
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<tr>
<td>Italy</td>
<td>0.1%</td>
<td>BBB</td>
<td>0.5%</td>
<td>-0.2%</td>
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<tr>
<td>Japan</td>
<td>0.0%</td>
<td>A+</td>
<td>0.7%</td>
<td>0.1%</td>
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</tbody>
</table>

**Sources:** Bloomberg, data as of June 18, 2020; Trading Economics, data as of June 20, 2020.
**Notes:** *Quarterly (as opposed to monthly) values from March 2020. **Unemployment for April 2020. Inflation rates are year-over-year. S&P Global long-term foreign currency debt ratings shown. There have been no changes in long-term foreign currency debt ratings for any of the countries in the sample since September 2019, with the exception of Canada which was downgraded from AAA to AA+ by Fitch Ratings on June 24, 2020, citing “the deterioration of Canada's public finances in 2020 resulting from the coronavirus pandemic”.6
Global Stock Prices

All of the broad market indices of the countries shown have experienced a deep decline since the COVID-19 pandemic, roughly proportional to the severity of their COVID outbreaks and the timeliness/depth of their lockdown – *e.g.*, the Asian countries have relatively smaller losses, compared to some in the E.U. The U.S. is an outlier (discussed on next slide).

Surprisingly, the US stock market has fallen the least despite having the most COVID cases. This may reflect the prominence of US equity markets in the world financial industry, plus a fortuitous industry mix:

- A handful of extremely large firms (bigger than some entire economies) are part of the S&P 500, and they became more important under social distancing, esp. Apple, Amazon, Google (Alphabet), Microsoft, and Facebook.
- The 5 largest technology companies comprised 18% of the S&P 500 (January 2020) and were responsible for 28% of the price rebound since the low point for the index on March 23.

**Market Capitalization (January – June 2020)**

**Market Capitalization Decline (March – June 2020)**

<table>
<thead>
<tr>
<th></th>
<th>Difference (Market Cap)</th>
<th>Difference (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain in S&amp;P 500 Market Capitalization (March 23 - June 24, 2020)</td>
<td>$7.031 Tr</td>
<td>36.4%</td>
</tr>
<tr>
<td>Gain in Top 5 Companies Market Capitalization (March 23 - June 24, 2020)</td>
<td>$1.958 Tr</td>
<td>47.7%</td>
</tr>
<tr>
<td>Percent Gain in S&amp;P 500 due to Top 5 Companies</td>
<td>27.9%</td>
<td>-</td>
</tr>
</tbody>
</table>

Gain in S&P 500 and Top 5 Companies in S&P 500 between the lowest point of decline during the COVID-19 period (March 23) and June 24, 2020.
Volatility of Global Stock Indices

In all countries, stock market volatility spiked in March 2020 at 3-4x normal levels, but by May had mostly subsided to about twice 2019’s (more typical) levels.

European markets remain the most volatile, China the least (actually having declined).

<table>
<thead>
<tr>
<th>Total Decline in Stock Price Since January 7</th>
<th>U.S.</th>
<th>South Korea</th>
<th>China</th>
<th>Japan</th>
<th>Germany</th>
<th>Sweden</th>
<th>Canada</th>
<th>Australia</th>
<th>France</th>
<th>U.K.</th>
<th>Italy</th>
<th>Spain</th>
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<tbody>
<tr>
<td>-5%</td>
<td>-7%</td>
<td>-7%</td>
<td>-9%</td>
<td>-10%</td>
<td>-10%</td>
<td>-11%</td>
<td>-16%</td>
<td>-20%</td>
<td>-20%</td>
<td>-20%</td>
<td>-24%</td>
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</table>

<table>
<thead>
<tr>
<th>Standard Deviation</th>
<th>U.S.</th>
<th>South Korea</th>
<th>China</th>
<th>Japan</th>
<th>Germany</th>
<th>Sweden</th>
<th>Canada</th>
<th>Australia</th>
<th>France</th>
<th>U.K.</th>
<th>Italy</th>
<th>Spain</th>
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<tbody>
<tr>
<td>2019</td>
<td>12.4</td>
<td>12.7</td>
<td>18.0</td>
<td>13.7</td>
<td>14.1</td>
<td>14.0</td>
<td>7.3</td>
<td>11.0</td>
<td>13.3</td>
<td>11.8</td>
<td>14.6</td>
<td>12.5</td>
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<tr>
<td>2020 (January - May)</td>
<td>48.9</td>
<td>37.7</td>
<td>23.2</td>
<td>35.5</td>
<td>43.4</td>
<td>38.6</td>
<td>49.0</td>
<td>41.3</td>
<td>43.0</td>
<td>39.0</td>
<td>47.5</td>
<td>43.3</td>
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</table>

| March 2020                                   | 93.1| 66.6        | 29.3  | 57.2  | 73.3    | 61.3   | 98.0   | 76.6      | 75.3   | 68.4 | 85.7  | 77.8 |
| April 2020                                   | 41.2| 29.6        | 14.0  | 35.3  | 41.6    | 37.0   | 36.0   | 31.7      | 38.1   | 36.4 | 37.7  | 34.0 |
| May 2020                                     | 22.9| 18.7        | 11.4  | 22.8  | 33.1    | 35.4   | 15.9   | 27.1      | 33.2   | 26.8 | 29.8  | 31.5 |

| Ratio of May 2020 / 2019                     | 1.8 | 1.5         | 0.6   | 1.7   | 2.3     | 2.5    | 2.2    | 2.5       | 2.5    | 2.3 | 2.0   | 2.5  |

Source: Bloomberg, data as of May 29, 2020.
Market risk premium, measured with DDM model, increased dramatically during March, then fell back down somewhat.

- Maximum 7-day rolling average of all countries reached **11.6%** on March 23 – often matching highest levels in the Global Financial Crisis of 2008.

- Over the entire period from January 7 to June 15, the average risk premium across all countries increased 60 bps from **9.3%** to **9.9%**.

- South Korea, the U.K., and Japan have the largest increase, while four countries (France, Sweden, China, and Germany) show a decrease in their MRP.

- Australia has lowest market risk premium on average, followed by the U.S. and Canada.

*Notes:* Market return estimated by Bloomberg with a forward-looking Dividend Discount Model (DDM); consistent with a market value capital structure. Premium comparisons not normalized for typical variance.
There is no simple pattern of which countries had relatively more COVID exposure (upper rows) vs. financial impacts (lower rows). Red boxes indicate largest impact, green indicate smallest.

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<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>South Korea</th>
<th>Japan</th>
<th>China</th>
<th>Sweden</th>
<th>Canada</th>
<th>Germany</th>
<th>Australia</th>
<th>U.K.</th>
<th>France</th>
<th>Italy</th>
<th>Spain</th>
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<tbody>
<tr>
<td>Infected Numbers per 100K People</td>
<td>664</td>
<td>24</td>
<td>14</td>
<td>6</td>
<td>550</td>
<td>274</td>
<td>229</td>
<td>30</td>
<td>452</td>
<td>284</td>
<td>394</td>
<td>525</td>
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<tr>
<td>Death Rates per 100K People</td>
<td>36</td>
<td>1</td>
<td>1</td>
<td>&lt;1</td>
<td>50</td>
<td>23</td>
<td>11</td>
<td>&lt;1</td>
<td>64</td>
<td>44</td>
<td>57</td>
<td>58</td>
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<td>(as of June 18, 2020)</td>
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<td>(Dates may vary based on geography)</td>
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<tr>
<td>YoY Decline in GDP</td>
<td>-5.9%</td>
<td>-1.2%</td>
<td>-5.2%</td>
<td>1.2%</td>
<td>-6.8%</td>
<td>-6.2%</td>
<td>-7.0%</td>
<td>-6.7%</td>
<td>-6.5%</td>
<td>-7.2%</td>
<td>-9.1%</td>
<td>-8.0%</td>
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<td>(as of April 2020)</td>
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<tr>
<td>% of Net Trade of GDP</td>
<td>-3.1%</td>
<td>5.0%</td>
<td>0.3%</td>
<td>0.8%</td>
<td>2.5%</td>
<td>-2.0%</td>
<td>6.2%</td>
<td>0.4%</td>
<td>-1.8%</td>
<td>-0.8%</td>
<td>2.5%</td>
<td>2.7%</td>
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<td>(Year end 2018)</td>
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<tr>
<td>Total Decline in Stock Price</td>
<td>-5.3%</td>
<td>-6.7%</td>
<td>-8.7%</td>
<td>-6.9%</td>
<td>-10.1%</td>
<td>-10.5%</td>
<td>-9.9%</td>
<td>-16.2%</td>
<td>-19.9%</td>
<td>-19.9%</td>
<td>-20.0%</td>
<td>-24.2%</td>
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<tr>
<td>(January 7 - June 15)</td>
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<tr>
<td>10- Year Govt Bond Yields</td>
<td>0.7%</td>
<td>1.4%</td>
<td>0.0%</td>
<td>2.8%</td>
<td>0.0%</td>
<td>0.5%</td>
<td>0.4%</td>
<td>0.9%</td>
<td>0.2%</td>
<td>0.0%</td>
<td>1.3%</td>
<td>0.6%</td>
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<td>(as of June 15, 2020)</td>
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<tr>
<td>YoY Change in Govt Bond Yield</td>
<td>-1.4%</td>
<td>-0.2%</td>
<td>0.1%</td>
<td>-0.5%</td>
<td>0.0%</td>
<td>-0.9%</td>
<td>-0.2%</td>
<td>-0.5%</td>
<td>-0.6%</td>
<td>-0.1%</td>
<td>-0.7%</td>
<td>0.1%</td>
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<td>(since June 14, 2019)</td>
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<tr>
<td>Market Risk Premium</td>
<td>8.0%</td>
<td>13.4%</td>
<td>11.0%</td>
<td>8.4%</td>
<td>10.9%</td>
<td>9.2%</td>
<td>10.3%</td>
<td>6.7%</td>
<td>10.8%</td>
<td>8.0%</td>
<td>11.4%</td>
<td>10.6%</td>
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<td>(as of June 15, 2020)</td>
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<tr>
<td>YoY Change in MRP</td>
<td>0.6%</td>
<td>3.6%</td>
<td>1.1%</td>
<td>-0.7%</td>
<td>-5.8%</td>
<td>1.3%</td>
<td>-0.8%</td>
<td>0.0%</td>
<td>0.6%</td>
<td>-1.1%</td>
<td>1.7%</td>
<td>1.9%</td>
</tr>
<tr>
<td>(since June 14, 2019)</td>
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</table>

Note: Sources can be found in the Appendix, individual country slides.
U.S. Financial Sector Impacts
Utility vs. Fed Bond Credit Spreads

Utility BBB bond spreads over 20 year treasury yields are up 20 basis points since the end of February.

- BBB yields up due to increased risk.
- In contrast, treasury yields are down about 22 basis points due to flight to quality behaviors and quantitative easing.

Compared to embedded rates, utility borrowing may be inexpensive now (and many utilities are refinancing).

- However, this opportunity has become somewhat more costly due to COVID.

The S&P 500 is comprised of primarily IT, health care, finance, and consumer companies.

- Energy and utilities account for slightly more than 6% of the total index.

**Industry Composition of S&P 500**

Broken down by Number of Members

- Communications Services: 2.7%
- Consumer Discretionary: 15.6%
- Consumer Staples: 26.6%
- Energy: 7.5%
- Financials: 10.5%
- Health Care: 11.0%
- Industrials: 2.9%
- Information Technology: 10.0%
- Materials: 7.3%
- Real Estate: 2.7%
- Utilities: 3.2%

Source: Bloomberg, data as of May 29, 2020.

The relative large share of the U.S. index coming from high tech and IT partly explains its resilient stock market.

Other countries with more dependence on energy (especially oil), raw materials and exports, or tourism are likely to be harder hit by COVID.
U.S. Required Returns

Current implied return expected for the market is about at 2019 levels, but the composition is very different.

- Implied returns rose steadily from the beginning of 2020 through March, but declined in April and May.
- Ten-year government bond rates are about 140 bps lower than the 2019 average, while the 8.1% MRP is about 100 bps higher, which results in a market return that is comparable to the 2019 average of 9.2%.

Source: Bloomberg, data as of June 18, 2020.
Notes: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year U.S. Treasury yield. Return based at approx. 70% equity capital structure.
Heightened Volatility

During the economic downturn due to COVID-19, the VIX volatility index reached an all time high of 83 in March.

- It remains high at approximately 35 on June 15th, well above the long-run average of 19.3.
- VIX has climbed higher recently on fears of a second outbreak.7

Volatility Index (VIX) Performance

![Graph showing VIX performance over time with key events marked]

- Peak during Financial Crisis of 80.86 (11/20/2008)
- VIX reaches all time high of 82.69 (3/16/2020)
- VIX climbs back up to 40.79 (6/11/2020)

Long Run Average: 19.3 (1/2/1990 – 6/15/2020)

U.S. utility index moved in close conjunction with the market through mid-April, but more recently has lagged behind the general market in recovery.

- The utility index was down 15% from February 3 to June 15, compared to S&P 500 decline of 6%.
- But volatility of utility stocks in 2020 has exceeded that of the overall market, contrary to normal patterns.

<table>
<thead>
<tr>
<th>Utility Index Stock Price Performance</th>
<th>Volatility of General &amp; Utility Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indexed from February 2020</td>
<td>Annualized Daily Standard Deviation</td>
</tr>
<tr>
<td></td>
<td>S&amp;P 500</td>
</tr>
<tr>
<td>2019</td>
<td>12.4%</td>
</tr>
<tr>
<td>2020 (January - May)</td>
<td>48.9%</td>
</tr>
<tr>
<td>March 2020</td>
<td>93.1%</td>
</tr>
<tr>
<td>April 2020</td>
<td>41.2%</td>
</tr>
<tr>
<td>May 2020</td>
<td>22.9%</td>
</tr>
</tbody>
</table>

Four-month daily betas have increased across U.S. electric, gas and water utilities from January 31 to May 31, more than doubling on average

- Similar increases in utility betas occurred during the Global Financial Crisis.
- These increases in beta would call for 300-400 bps increase in ROE under CAPM.

Electric Utility 4-Month Daily Betas

January 31 Average: 0.51*
May 31 Average: 1.03*

<table>
<thead>
<tr>
<th>Electric Utility 4-Month Daily Beta Averages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>January 31</strong></td>
</tr>
<tr>
<td>Electric</td>
</tr>
<tr>
<td>Gas</td>
</tr>
<tr>
<td>Water</td>
</tr>
</tbody>
</table>

Source: Bloomberg, data as of May 31, 2020.
Note: *PG&E is not included in sample average due to bankruptcy restructuring.

It is possible these changes are transitory, but there are structural reasons to expect them to persist, esp. utility funded moratoriums on shutting off delinquent accounts, and increased utility exposure to macro recovery of the commercial sectors of the economy.
Conclusions

COVID has increased volatility and associated risk metrics in most countries, somewhat proportionally to how severe the incidence was ... but not in any precise relation.

- The EU countries hit hardest by COVID-19 generally experienced the greatest downturn in stock prices (i.e., Italy, Spain, U.K.), while countries such as China and South Korea that have lower numbers of reported deaths per 100K people experienced lower stock price declines.
- Price levels in the US stock market are a significant outlier, possibly due to its diverse composition and inclusion of substantial IT and internet platform mega-firms – though its volatility increased more than most markets.

Out of the country sample analyzed, there have been no S&P sovereign credit downgrades due to the pandemic.*

- Utility or corporate bonds do not necessarily follow the government bond yield, so the impact on cost of debt is uncertain.

The Market Risk Premium increased in all countries in March and has remained elevated in all countries but China, France, Germany, and Sweden (where it has declined).

There is clear evidence that the cost of equity, at least in the US, has increased due to higher betas and greater exposure to macroeconomic conditions. How long this will persist depends on the shape of the recovery.

*Canada was downgraded from AAA to AA+ by Fitch Ratings on June 24, 2020, citing “the deterioration of Canada’s public finances in 2020 resulting from the coronavirus pandemic.”

It may be very appropriate to have utilities defer cost recovery in this environment that is so fragile and painful for their customers, but COVID is not a reason to lower their allowed returns.
Appendix: Country-Specific Observations
Canada has experienced some of the highest volatility in its market, and is ultimately down around 11% since the beginning of 2020, in the midrange of the 12 countries in our sample.

- Canada’s social distancing policy varies across the country, but began generally around March 12, with gathering restrictions, but limited Provincial lockdowns.8
- Canada’s index is comprised of primarily materials and industrials companies, but the index has significantly more energy & utility companies than the U.S., with more than 20% of the overall index made up of energy & utility.

### Summary Statistics4,8,9,10

<table>
<thead>
<tr>
<th></th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death Rates per 100K People (as of June 18, 2020)</td>
<td>23</td>
</tr>
<tr>
<td>Lock Down Date (Dates may vary based on geography)</td>
<td>3/12</td>
</tr>
<tr>
<td>YoY Decline in GDP (as of April 2020)</td>
<td>-6.2%</td>
</tr>
<tr>
<td>% of Net Trade of GDP (Year end 2018)</td>
<td>-2.0%</td>
</tr>
<tr>
<td>Total Decline in Stock Price (January 7 - June 15)</td>
<td>-10.5%</td>
</tr>
<tr>
<td>YoY Change in Govt Bond Yield (since June 14, 2019)</td>
<td>-0.9%</td>
</tr>
<tr>
<td>YoY Change in MRP (since June 14, 2019)</td>
<td>1.3%</td>
</tr>
</tbody>
</table>

### Expected Canadian Market Returns

- DDM-implied Market Return
  - Dec-19: 7.2%
  - Jan-20: 8.5%
  - Feb-20: 8.7%
  - Mar-20: 9.4%
  - Apr-20: 9.2%
  - May-20: 8.7%
- Market Risk Premium
  - Dec-19: 1.7%
  - Jan-20: 1.3%
  - Feb-20: 1.1%
  - Mar-20: 0.7%
  - Apr-20: 0.5%
  - May-20: 0.5%
- Risk-Free Rate
  - Dec-19: 9.3%
  - Jan-20: 9.7%
  - Feb-20: 9.8%
  - Mar-20: 10.1%
  - Apr-20: 9.8%
  - May-20: 9.3%

### S&P/TSX Composite Index

- 229 Members
- Communications Services
- Consumer Discretionary
- Consumer Staples
- Energy
- Financials
- Health Care
- Industrials
- Information Technology
- Materials
- Real Estate
- Utilities
The U.K. has experienced some of the highest death rates and largest stock decline in our sample, and is ultimately down around 20% since the beginning of 2020.

- The U.K. issued its stay-at-home order on March 23 but began slowing easing restrictions for certain business in early May; however, the government is still encouraging people to work from home and limit social gatherings.\(^{11,12}\)
- The U.K.’s index has a diverse industry breakdown, with financials, healthcare, energy, and consumer staples comprising the majority of the index.
- Implied market returns have increased by 10 basis points in May, and remain 150 basis points above the December 2019 market return.

**Summary Statistics\(^{4,9,10,12,13}\)**

<table>
<thead>
<tr>
<th>Category</th>
<th>U.K.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death Rates per 100K People (as of June 18, 2020)</td>
<td>64</td>
</tr>
<tr>
<td>Lock Down Date (Dates may vary based on geography) (as of April 2020)</td>
<td>3/23</td>
</tr>
<tr>
<td>YoY Decline in GDP (% of Net Trade of GDP (Year end 2018))</td>
<td>-6.5%</td>
</tr>
<tr>
<td>YoY Change in Govt Bond Yield (since June 14, 2019)</td>
<td>-0.6%</td>
</tr>
<tr>
<td>YoY Change in MRP (since June 14, 2019)</td>
<td>0.6%</td>
</tr>
</tbody>
</table>

**Expected U.K. Market Returns**

- DDM-implied Market Return: 10.9%
- Market Risk Premium: 0.8%
- Risk-Free Rate: 0.2%
- FTSE 100 Index:
  - Communications Services: 18.1%
  - Consumer Discretionary: 10.7%
  - Consumer Staples: 4.9%
  - Energy: 3.9%
  - Financials: 1.1%
  - Health Care: 10.8%
  - Industrials: 1.2%
  - Information Technology: 11.5%
  - Materials: 13.4%
  - Real Estate: 16.9%
  - Utilities: 6.8%
  - 100 Members: 100%

Source: Bloomberg, data as of June 18, 2020.
Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year Bank of England bond yield.
Germany has experienced moderate market declines of 10% since the beginning of January, with a low reported death rate.

- Germany enforced lockdowns from late March through beginning of May, and kept their death rate down to 11 per 100,000 people.\(^4,14\)

- Implied market returns have increased by 10 basis points in May, and remain in line with pre-2020 levels of around 10% market return.

**Expected German Market Returns**

<table>
<thead>
<tr>
<th>Month</th>
<th>DDM-implied Market Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec-19</td>
<td>10.2%</td>
</tr>
<tr>
<td>Jan-20</td>
<td>10.7%</td>
</tr>
<tr>
<td>Feb-20</td>
<td>11.6%</td>
</tr>
<tr>
<td>Mar-20</td>
<td>12.8%</td>
</tr>
<tr>
<td>Apr-20</td>
<td>10.4%</td>
</tr>
<tr>
<td>May-20</td>
<td>10.4%</td>
</tr>
</tbody>
</table>

**DAX Index**

- Communications Services: 23.3%
- Consumer Discretionary: 6.7%
- Consumer Staples: 16.7%
- Energy: 10.0%
- Financials: 20.0%
- Health Care: 13.3%
- Industrials: 10.0%
- Information Technology: 13.3%
- Materials: 6.7%
- Real Estate: 10.0%
- Utilities: 10.0%

**Summary Statistics\(^4,9,14\)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death Rates per 100K People</td>
<td>11</td>
</tr>
<tr>
<td>Lock Down Date</td>
<td>3/23 - 5/10</td>
</tr>
<tr>
<td>YoY Decline in GDP (as of April 2020)</td>
<td>-7.0%</td>
</tr>
<tr>
<td>% of Net Trade of GDP (Year end 2018)</td>
<td>6.2%</td>
</tr>
<tr>
<td>Total Decline in Stock Price</td>
<td>-9.9%</td>
</tr>
<tr>
<td>YoY Change in Govt Bond Yield</td>
<td>-0.2%</td>
</tr>
<tr>
<td>YoY Change in MRP</td>
<td>-0.8%</td>
</tr>
</tbody>
</table>

Source: Bloomberg, data as of June 18, 2020.

Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year Deutsche Bundesbank bond yield.
France has experienced some of the largest stock market declines, with a 20% decline since beginning of 2020, aligning with their high death rate of 44 deaths per 100,000 people.  

- France enforced strict social distancing lockdowns from mid-March through mid-May.  
- Implied market returns have decreased by 50 basis points in May, and remain 70 basis points below pre-2020 levels.

**Summary Statistics**

<table>
<thead>
<tr>
<th>Description</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death Rates per 100K People as of June 18, 2020</td>
<td>44</td>
</tr>
<tr>
<td>Lock Down Date (varies by geography)</td>
<td>3/18 - 5/11</td>
</tr>
<tr>
<td>YoY Decline in GDP (as of April 2020)</td>
<td>-7.2%</td>
</tr>
<tr>
<td>% of Net Trade of GDP (Year end 2018)</td>
<td>-0.8%</td>
</tr>
<tr>
<td>Total Decline in Stock Price (January 7 - June 15)</td>
<td>-19.9%</td>
</tr>
<tr>
<td>YoY Change in Govt Bond Yield (since June 14, 2019)</td>
<td>-0.1%</td>
</tr>
<tr>
<td>YoY Change in MRP (since June 14, 2019)</td>
<td>-1.1%</td>
</tr>
</tbody>
</table>

Source: Bloomberg, data as of June 18, 2020.  
Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year Banque de France bond yield.
Italy has experienced some of the worst stock price declines and COVID-19 death rates in our sample, with a 20% decline in stock price and high death rate of 57 deaths per 100,000 people.\(^4\)

- Italy issued strict social distancing lockdowns from March through June, in an attempt to keep their high death rate down.\(^{16}\)

- Implied market returns have decreased by 60 basis points in May, but remain 170 basis points above pre-2020 levels.

### Summary Statistics\(^{4,9,16}\)

<table>
<thead>
<tr>
<th>Category</th>
<th>Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death Rates per 100K People (as of June 18, 2020)</td>
<td>57</td>
</tr>
<tr>
<td>Lock Down Date (Dates may vary based on geography)</td>
<td>3/11 - 6/3</td>
</tr>
<tr>
<td>YoY Decline in GDP (as of April 2020)</td>
<td>-9.1%</td>
</tr>
<tr>
<td>% of Net Trade of GDP (Year end 2018)</td>
<td>2.5%</td>
</tr>
<tr>
<td>Total Decline in Stock Price (January 7 - June 15)</td>
<td>-20.0%</td>
</tr>
<tr>
<td>YoY Change in Govt Bond Yield (since June 14, 2019)</td>
<td>-0.7%</td>
</tr>
<tr>
<td>YoY Change in MRP (since June 14, 2019)</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

Source: Bloomberg, data as of June 18, 2020.

Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year Banca d’Italia bond yield.
Spain’s stock has decreased the most out of our sample, down by about 24% compared to the beginning of the year; despite strict lockdown policies, Spain has experienced the second highest death rate due to COVID-19 out of the sample.

• The Spanish government issued some of the strictest lockdown policies in the world from mid-March to late May.\textsuperscript{18}

• Almost a quarter of the Spanish Index is comprised of utilities, with another 20% coming from financial companies.

• Implied market returns have increased by 40 basis points in May, after declining by 90 basis point in April, returning it to pre-2020 levels.

Source: Bloomberg, data as of June 18, 2020.

Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year Banco de España bond yield.
Sweden

Sweden’s stock is down about 10% compared to the beginning of the year; its death rate is in the upper range of death rates in our sample, while the government has not issued mandatory lockdowns.

- Sweden’s index is comprised of predominantly industrials, followed by financials. The index contains zero utilities.
- Implied market returns have increased by 20 basis points in May, after declining by 90 basis points in April. As shown, Swedish market returns have experienced large volatility over the past year and a half, with the current market return below pre-2020 levels, but 50 basis points above January 2020 levels.

Source: Bloomberg, data as of June 18, 2020.

Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year Sveriges Riksbank bond yield.

### Summary Statistics

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death Rates per 100K People (as of June 18, 2020)</td>
<td>50</td>
</tr>
<tr>
<td>Lock Down Date (Dates may vary based on geography)</td>
<td>None</td>
</tr>
<tr>
<td>YoY Decline in GDP (as of April 2020)</td>
<td>-6.8%</td>
</tr>
<tr>
<td>% of Net Trade of GDP (Year end 2018)</td>
<td>2.5%</td>
</tr>
<tr>
<td>Total Decline in Stock Price (January 7 - June 15)</td>
<td>-10.1%</td>
</tr>
<tr>
<td>YoY Change in Govt Bond Yield (since June 14, 2019)</td>
<td>0.0%</td>
</tr>
<tr>
<td>YoY Change in MRP (since June 14, 2019)</td>
<td>-5.8%</td>
</tr>
</tbody>
</table>
Australia has experienced a 16% drop in stock prices since the beginning of 2020, which is on the high end of our range, despite reporting low death rates.

- Australia began social lockdowns on March 30, which is still ongoing today.\textsuperscript{20}
- The reported death rate is less than 1 death per 100,000 people.\textsuperscript{4}
- Implied market returns have remained constant in May and are around pre-2020 levels.

Source: Bloomberg, data as of June 18, 2020.

Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year Reserve Bank of Australia bond yield.
Japan’s stock is down about 9% compared to the beginning of the year, on the lower end of the stock decline range, which aligns with their reportedly low death rates (1 per 100,000 people).4

- Japan has not implemented social distancing lockdowns, but has still reported low death rates.
- Japan’s index is comprised primarily of industrials, IT, health care and discretionary consumer companies.
- Implied market returns have increased by 70 basis points in May, and are 110 basis points above pre-2020 levels.

Summary Statistics4,9,21

<table>
<thead>
<tr>
<th>Death Rates per 100K People</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lock Down Date (Dates may vary based on geography)</td>
<td>None</td>
</tr>
<tr>
<td>YoY Decline in GDP (as of April 2020)</td>
<td>-5.2%</td>
</tr>
<tr>
<td>% of Net Trade of GDP (Year end 2018)</td>
<td>0.3%</td>
</tr>
<tr>
<td>Total Decline in Stock Price (January 7 - June 15)</td>
<td>-8.7%</td>
</tr>
<tr>
<td>YoY Change in Govt Bond Yield (since June 14, 2019)</td>
<td>0.1%</td>
</tr>
<tr>
<td>YoY Change in MRP (since June 14, 2019)</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

Source: Bloomberg, data as of June 18, 2020.

Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year Bank of Japan bond yield.
China’s stock is down about 7% compared to the beginning of the year, while the government has issued strict lockdowns beginning in January and reports low death rates (<1 per 100,000 people).

- China’s index is comprised of predominantly financial companies, followed by industrials.
- Implied market returns have increased by 10 basis points in May, but remain 80 basis points below pre-2020 levels.

Source: Bloomberg, data as of June 18, 2020.

Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year People’s Bank of China bond yield.
South Korea’s stock is down about 7% compared to the beginning of the year, while the government has not issued mandatory lockdowns but is reporting low death rates.

- South Korea reported low death rates (1 per 100,000 people) due to its comprehensive contract tracing efforts.\(^4\)
- South Korea’s index is comprised primarily of industrials, materials, and discretionary consumer companies.
- Implied market returns have increased by 60 basis points in May, and remain 246 basis points above the pre-2020 levels.

Source: Bloomberg, data as of June 18, 2020.

Note: Market return estimated by Bloomberg with a forward-looking Dividend Discount Model. Risk-free rate is based on 10-year Bank of Korea bond yield.
Sources
Sources


Sources


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<thead>
<tr>
<th>Our Services</th>
<th>Our People</th>
<th>Our Insights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and Consulting</td>
<td>Renowned Experts</td>
<td>Thoughtful Analysis</td>
</tr>
<tr>
<td>Litigation and Support</td>
<td>Global Teams</td>
<td>Exceptional Quality</td>
</tr>
<tr>
<td>Expert Testimony</td>
<td>Intellectual Rigor</td>
<td>Clear Communication</td>
</tr>
</tbody>
</table>
Our Practices and Industries

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- Competition & Market Manipulation
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- Electric Transmission
- Electricity Market Modeling & Resource Planning
- Electrification & Growth Opportunities
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- Energy Storage
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- Market Design
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- Nuclear
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