



SWIB Update

*ETF Board Meeting
March 26, 2020*

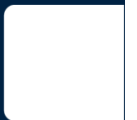
David Villa, Executive Director/Chief Investment Officer

Edwin Denson, Managing Director, Asset & Risk Allocation

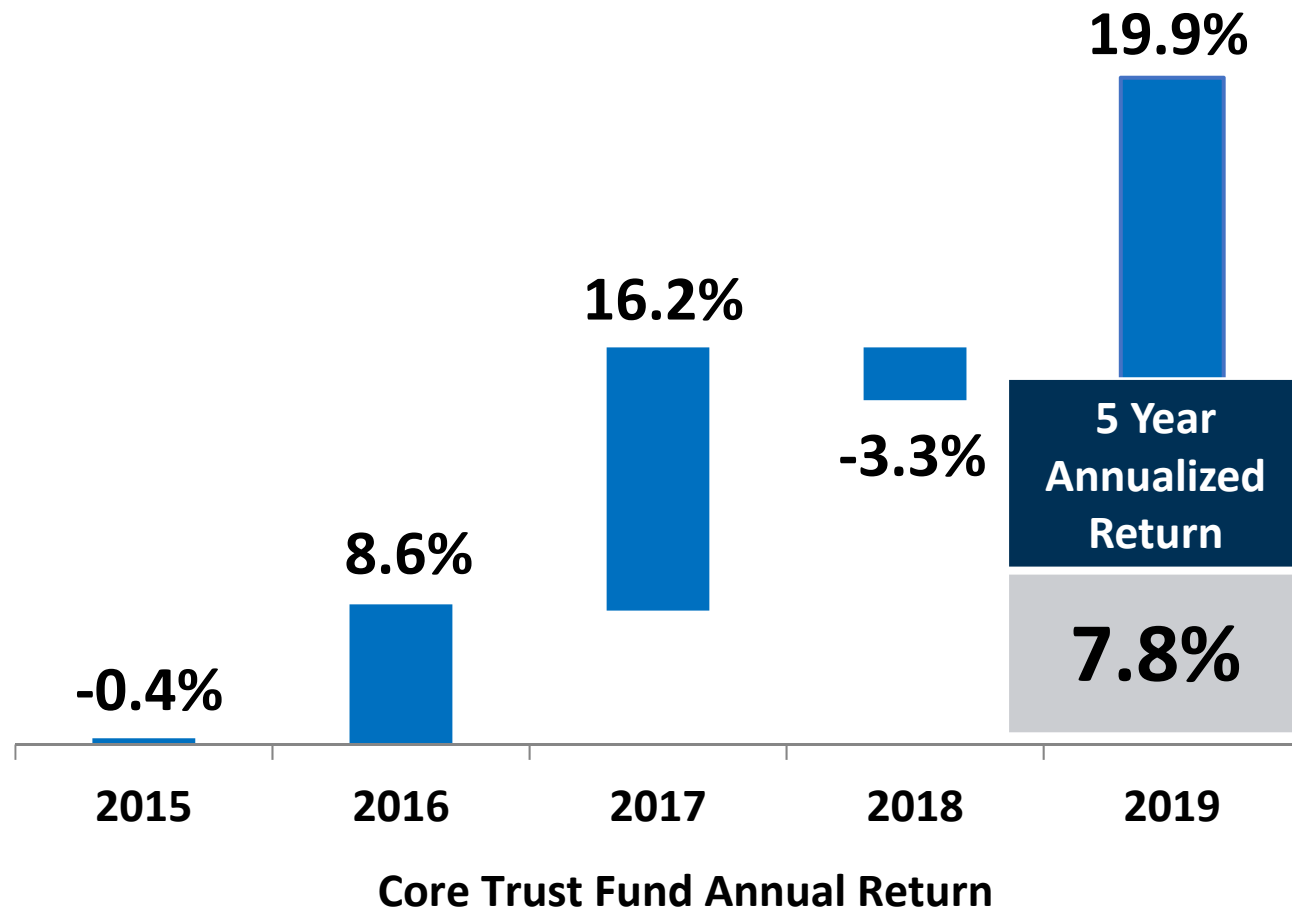
Brian Hellmer, Managing Director, Global Public Market Strategies



Performance Outlook & Covid-19 Outbreak

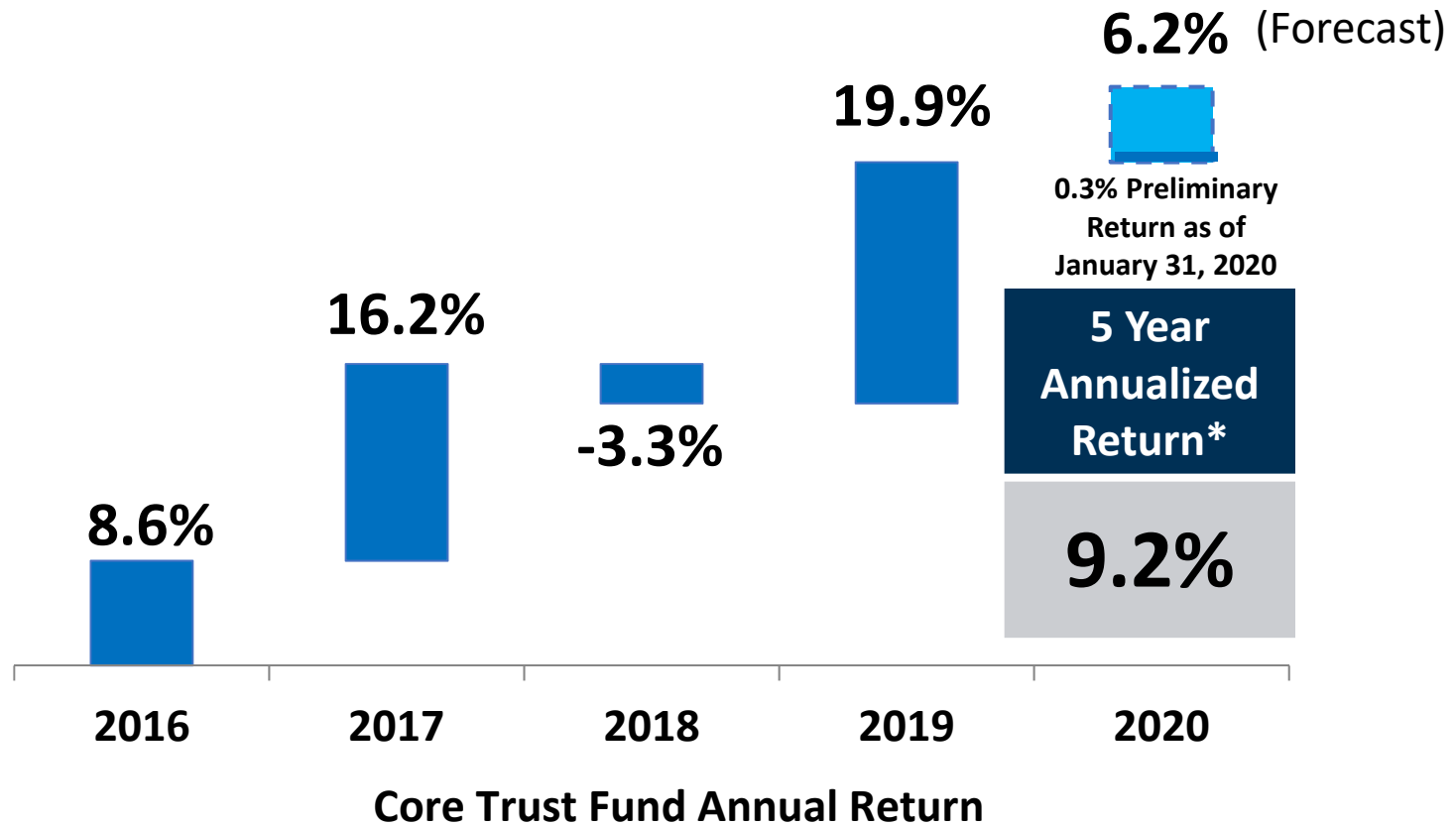


2019 CTF 5-Year Return Decomposed



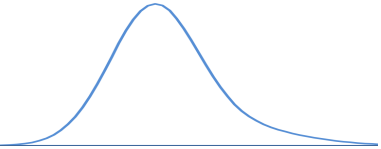
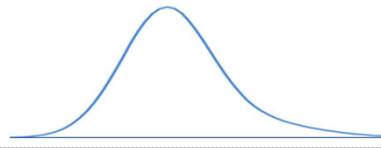
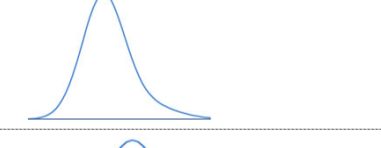
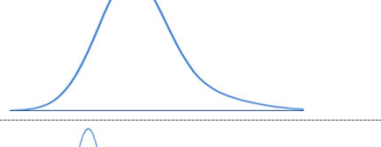

Source: SWIB; 7.8% is the geometric average realized return, 2015 to 2019; Gross of Fee.

2020 CTF 5-Year Return - ?



Source: SWIB; 5-year Annualized Return is forecast using NEPC assumptions for 2020; Gross of Fee.

Asset Class Expected Performance

| Asset Class | December, 2019 Expected 5-7 year return forecast for 2020* | March, 2020 Expected 5-7 year return forecast |
|----------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| US Equities | 6.0%-6.3% |  |
| Non-US Equities (unhedged) | 6.8% |  |
| Investment Grade Credit | 4.0% |  |
| High Yield Credit | 5.3% |  |
| US Treasuries | 2.5% |  |

*Source: NEPC expected returns are annualized averages expected over the next 5 to 7 years.



Benchmark Index Performance

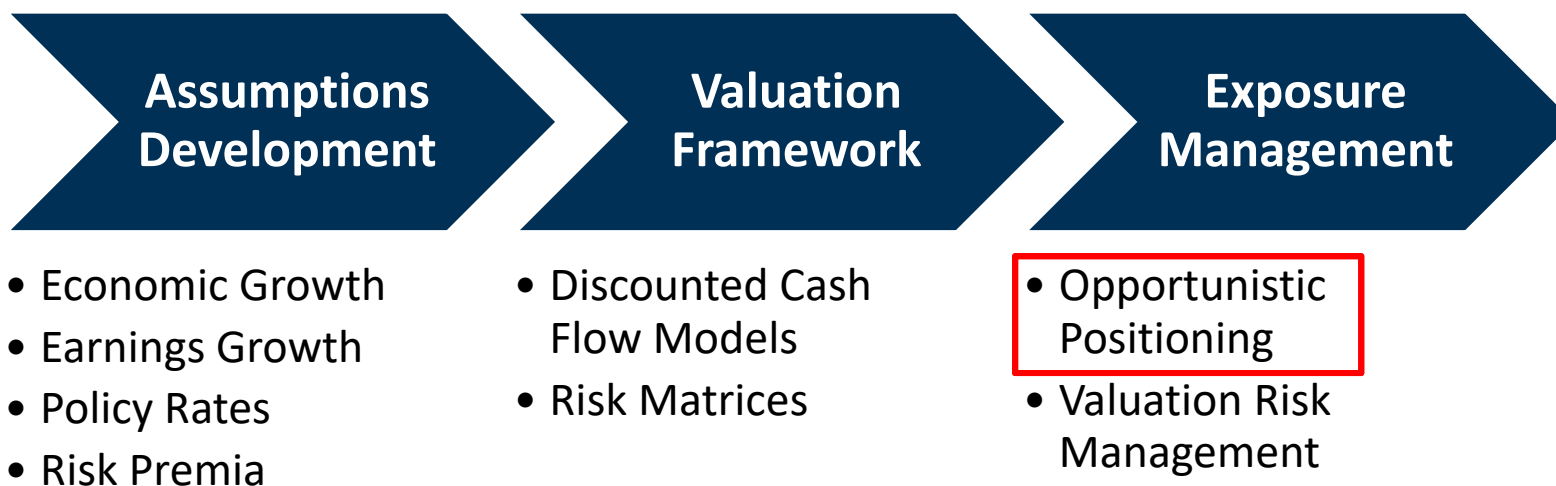
Safe-haven assets fare well in Q1.

| Summary of Returns | | | | | |
|-----------------------------------------------------|------------|-------------|-------------|--------------|-----------------------------|
| February 29, 2020 | | | | | |
| Benchmark Indices (% change, annualized) | YTD | 1 Yr | 5 Yr | 10 Yr | 10 Yr Volatility |
| CTF Policy Benchmark (Gross of Fee) | -3.0% | 8.6% | 6.3% | 7.9% | 7.4% |
| S&P 500 | -8.3% | 8.2% | 9.2% | 12.7% | 12.7% |
| Russell 2000 | -11.4% | -4.9% | 5.1% | 10.4% | 17.2% |
| MSCI ACWI Gross | -9.0% | 4.5% | 6.1% | 8.7% | 13.4% |
| MSCI ACWI Gross (Local) | -8.1% | 5.5% | 6.7% | 9.6% | 11.5% |
| MSCI World ex US Equities | -10.6% | -0.4% | 2.0% | 4.7% | 14.6% |
| MSCI World ex US Equities (Local) | -8.8% | 1.4% | 2.9% | 6.4% | 11.4% |
| MSCI Emerging Markets | -9.7% | -1.9% | 2.7% | 3.2% | 17.2% |
| Barclays Capital Govt/Credit | 4.5% | 13.4% | 3.9% | 4.2% | 3.4% |
| BOFA ML High Yield | -1.5% | 5.9% | 5.2% | 7.1% | 5.8% |
| Citigroup World Govt Bonds | 2.6% | 8.2% | 2.9% | 2.1% | 5.3% |
| Citigroup World Govt Bonds (Hedged) | 3.9% | 10.9% | 4.0% | 4.2% | 3.0% |

Source: FactSet, SWIB; CTF Benchmark return is preliminary.

Exposure Management Process

Exploit near-term opportunities and manage valuation risk.



COVID-19 Outbreak

Outline for Discussion

1. Current Situation

- Spread outside China up sharply
- Tens or hundreds of millions of infections a possibility in 2020

2. Past Comparisons

- More transmissible than other new diseases of the past decade
- Deaths per infection: less deadly than SARS, more than seasonal flu

3. What will stop COVID-19?

- Containment measures are the only immediate line of defense
- A vaccine could be a year or even years away, antivirals months away

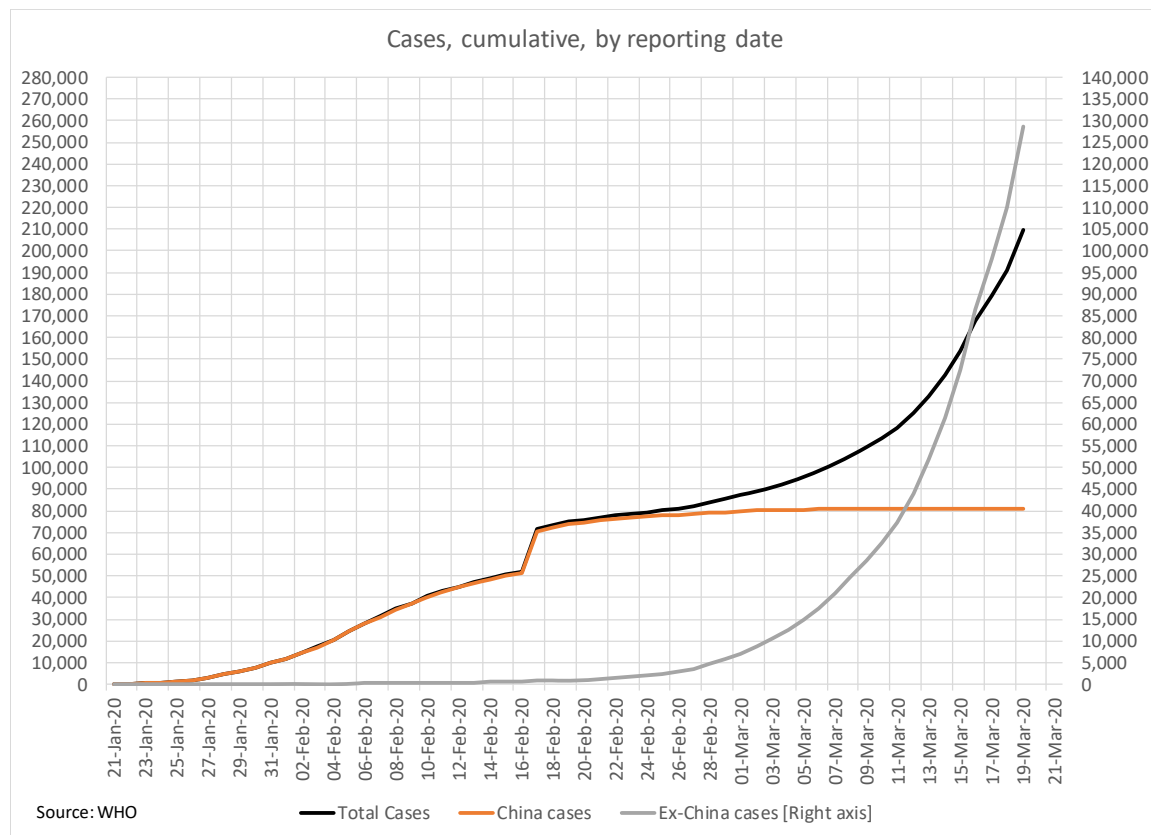
4. Economic Effects

- Equity markets seem to have been pricing a SARS-like quick rebound
- Impact on global activity likely to play out over several quarters

Current Situation

Ex-China cases are just getting started.

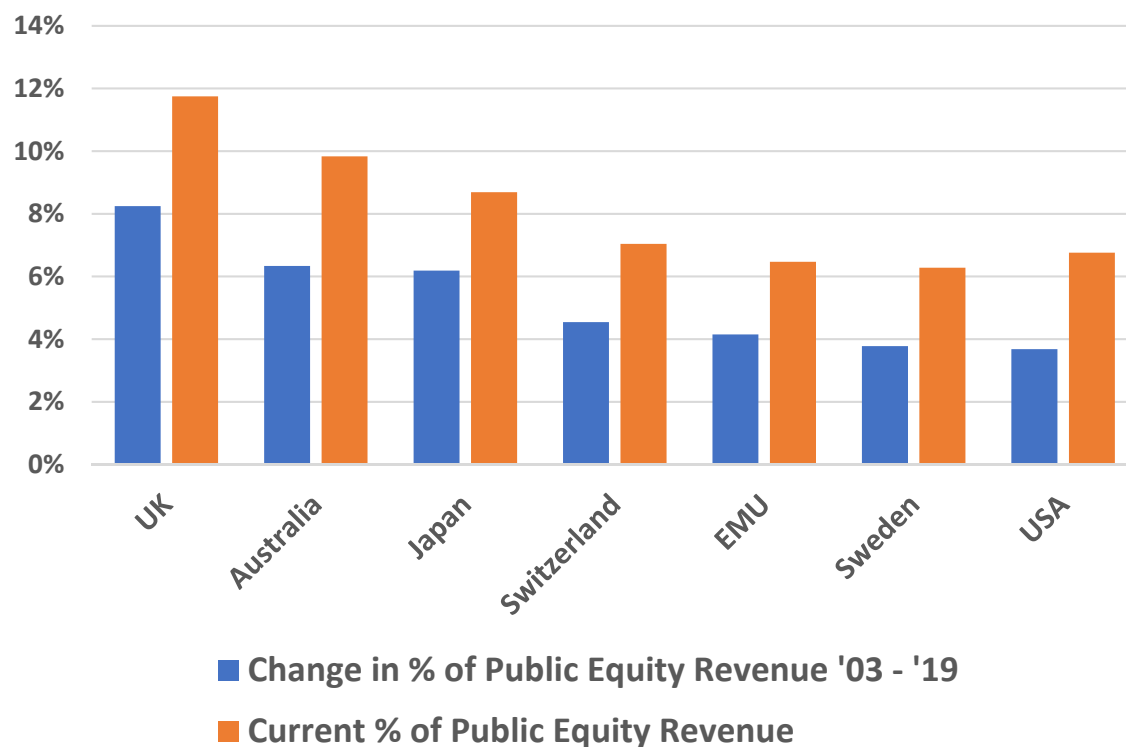
- Ex-China cases are growing exponentially, with many more cases likely over coming weeks.
- Experts think that, absent effective non-pharma containment measures, infections this year could reach into the tens or hundreds of millions globally.
- Stress to healthcare systems may be severe.



Past Comparisons

More transmissible than SARS, and in a more integrated economy.

**Public Equities Revenue Exposure
to China+Taiwan+Hong Kong
Most Significant Changes 2003 to 2019**



- Less deadly than SARS as measured by deaths per infection, but more transmissible.
- China is much more closely integrated into the global economy than was the case during the 2003 SARS outbreak.

Source: FactSet



What will stop COVID-19?

Non-pharmaceutical containment

Figure

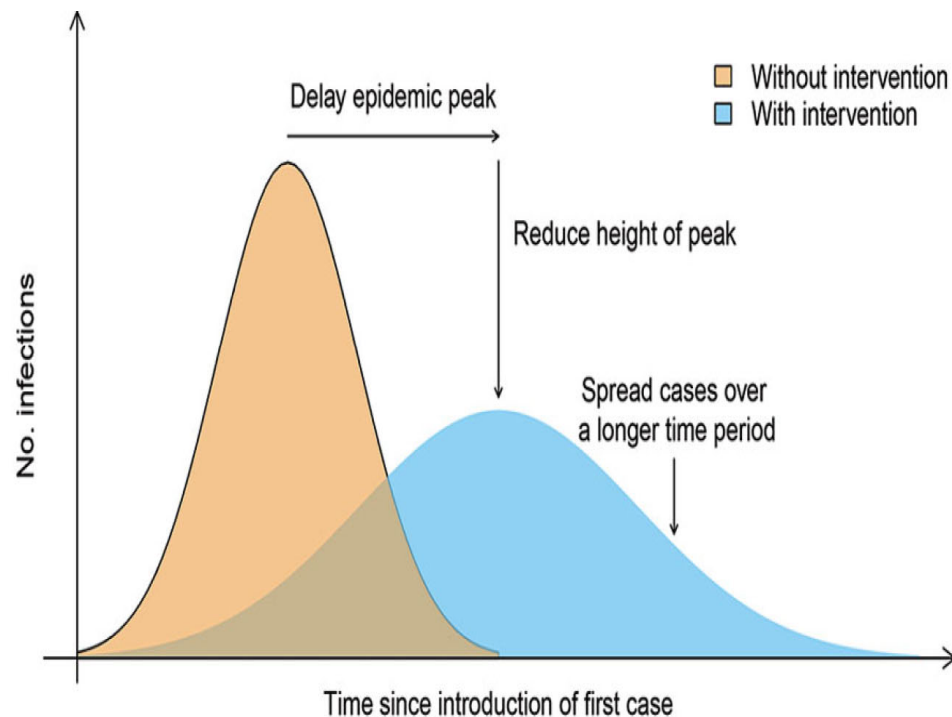


Figure. Intended impact of social distancing measures as nonpharmaceutical interventions for an influenza pandemic. Adapted from similar diagrams in the European Centre for Disease Prevention and Control Technical Report (3) and the Centers for Disease Control and Prevention Guidance Report (4).

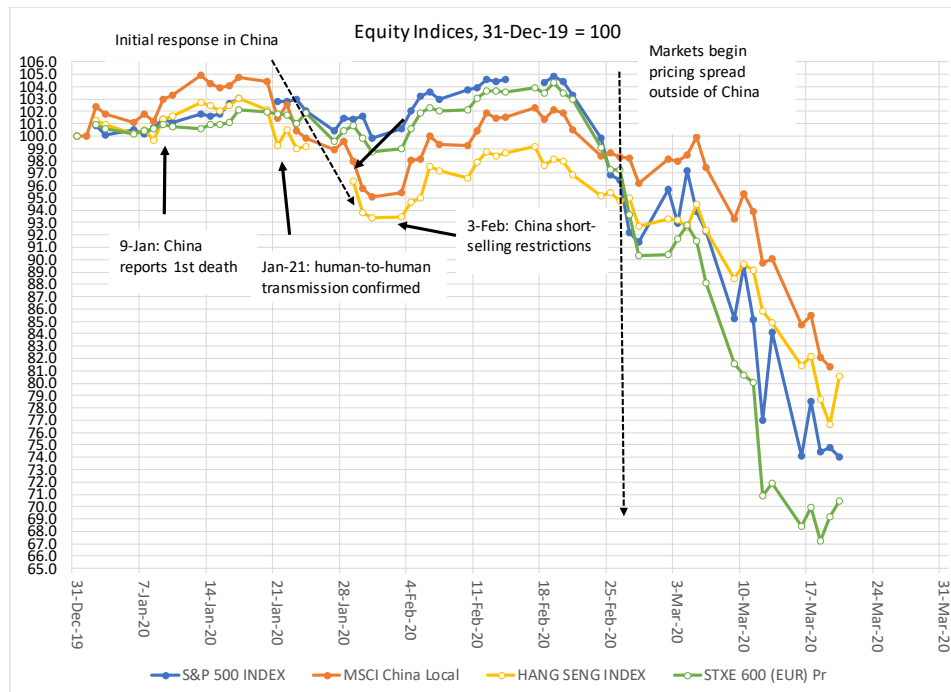
Source: Fong et al, "Nonpharmaceutical Measures for Pandemic Influenza in Nonhealthcare Settings—Social Distancing Measures," *Emerging Infectious Diseases Journal*, 26(50), 2020.

- Quarantines, travel restrictions, business closures, other prudent “social distancing” are the only immediate line of defense.
- New or, more likely, repurposed existing antivirals might be able to help slow transmission on a timeline of months.
- A vaccine could be a year or even years away, and even then there are questions of how quickly production could be scaled.

Economic Effects

A sharp V-shaped rebound unlikely.

Until about 21-Feb, equity markets seem to have been pricing a SARS-like outcome, limited to Asia and with quick economic rebound.



An extended period of quarantine and business closures in China will have ramifications far outside its borders, due to

- (i) its demand for goods & services of multinational firms,
- (ii) its supply of inputs to production of firms outside China, or
- (iii) its role as a final assembly location for many goods sold worldwide, and especially in the tech sector.

Risk and Opportunity: 2 Sides of the Coin

Specific sectors may gain, even during crisis.

| Sector | Expected Losses | Potential Gains |
|------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Consumer Discretionary | (Leisure) Cruise ship bookings will be impacted for an extended period. | (Autos) Disruptions to public transit during crisis may nudge new consumers toward car ownership. |
| Technology | (Hardware) Following Trump tariffs, there is now even more incentive to diversify supply chains away from China. | (Software) Global Software sector outperformed Hardware by more than 6% mid-January to mid-February. Recurring revenue streams fare better during crises. |
| Materials | Disruption to China's industrial activity created an air pocket in global demand. | Steel and Aluminum producers outside China may actually benefit by satisfying demand that China (a net exporter of these products) cannot. |

Source: SWIB Analysts



Context on pandemics, epidemics, & new disease outbreaks

- COVID-19 is proving to be considerably more infectious than SARS, MERS, and 2009 avian flu although less deadly to those infected.
- The deaths per infection rate is likely to fall from the current naïve ~3%, maybe to as low as 0.5%.
- This would still be 10x more deadly than seasonal flu.
- The combination of infectiousness and greater-than-flu fatality rate is worrisome.

| Influenza and novel respiratory diseases | | | | | | | | | |
|------------------------------------------|------------|----------------------------|---------------|----------------------|----------------------------------|------------------------------|-----------------------|------------------|-----------------------|
| [Pandemics in blue] | | | | | | | | | |
| Event | Viral type | Dates | Infections* | World excess deaths* | Infections as % world population | Deaths as % world population | Deaths per infection* | World population | Sources |
| 1729 Russian flu | ? | 1729-1732 | | 400,000 | | 0.05% | | 803,000,000 | [0] |
| 1781 China flu | ? | 1781-82 | | 800,000 | | 0.08% | | 997,973,306 | [0] |
| 1830 China Flu | ? | 1830-1833 | 252,026,179 | 900,000 | 22.5% | 0.08% | 0.36% | 1,120,116,353 | [0] |
| 1889 Russian flu | H3N8 | Dec-1889/Mar-1890 | 714,285,714 | 1,000,000 | 42.7% | 0.06% | 0.14% | 1,671,000,000 | [7] |
| 1918-20 Spanish Flu | H1N1 | Jan-1918/Dec-1920 | 500,000,000 | 50,000,000 | 27.0% | 2.70% | 10.0% | 1,849,985,396 | CDC & [1] |
| 1957-58 Asian Flu | H2N2 | Feb-1957/Oct-1958 | 733,333,333 | 1,100,000 | 25.1% | 0.038% | 0.15% | 2,925,686,705 | CDC, WHO, & [2] |
| 1968 Hong Kong Flu | H3N2 | Jul-1968/1970 | 666,666,667 | 1,000,000 | 18.8% | 0.028% | 0.15% | 3,551,599,127 | CDC, WHO |
| Avian Flu | H5N1 | May-1997/Apr-2015 | 907 | 483 | 0.000014% | 0.000007% | 53.3% | 6,623,517,833 | [5] |
| SARS | SARS-CoV | Nov-2002/Jul-2003 | 8,096 | 774 | 0.000127% | 0.000012% | 9.6% | 6,381,185,114 | CDC |
| 2009 Swine Flu | H1N1/09 | Mar-2009/Dec-2009 | 943,000,000 | 188,600 | 13.7% | 0.002744% | 0.02% | 6,872,767,093 | [4], [4a], [4b], [4c] |
| MERS | MERS-CoV | 2012/2019 | 2,494 | 858 | 0.000034% | 0.000012% | 34.4% | 7,295,290,765 | WHO |
| 2019 COVID-19 | SARS-CoV-2 | Dec-19-Now | 209,839 | 8,778 | 0.002692% | 0.000113% | 4.2% | 7,794,798,739 | WHO |
| Seasonal flu | Varies | 1999-2015 | 1,000,000,000 | 468,538 | 14.9% | 0.006987% | 0.05% | 6,705,946,610 | WHO & [6] |
| <i>Memoranda:</i> | | | | | | | | | |
| Ebola | EBOV | Dec-2013/Mar-2016 | 28,646 | 11,323 | 0.0004% | 0.000153% | 39.5% | 7,379,797,139 | [3] |
| AIDS | HIV | 2006 [Peak mortality] | | 1,950,000 | | 0.029441% | | 6,623,517,833 | IHME |
| AIDS | HIV | 2017 Mortality | | 950,000 | | 0.012586% | | 7,547,858,925 | IHME |
| AIDS | HIV | 1997 [Peak new infections] | 3,300,000 | | 0.0559% | | | 5,905,045,788 | IHME |
| AIDS | HIV | 2018 New infections | 1,700,000 | | 0.0223% | | | 7,631,091,040 | IHME |

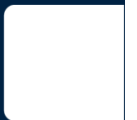
*Some cells above are SWIB imputations. Notably, deaths & infections differ by kind of event: [1] low-case events [avian flu, SARS, MERS, COVID-19 so far], with physician-confirmed case counts [e.g., lab or lab+symptom], and [2] high-case or pandemic events, for which both death & case counts are estimated *ex post* by statistical methods. Statistical estimates depend on records of mortality due to respiratory problems, in excess of "normal" causes, e.g., seasonal flu...
 ...and are by nature somewhat rough estimates: midpoint estimates with fairly wide confidence bands are shown.

Sources:

- [0] Potter, "A history of influenza," Journal of Applied Microbiology 2001, 91, 572-579.
- [1] Johnson & Mueller, "Updating the Accounts: Global Mortality of the 1918–1920 'Spanish' Influenza Pandemic," Bull. Hist. Med., 2002 76: 105-115.
- [2] Viboud et al, "Global Mortality Impact of the 1957-1959 Influenza Pandemic," Journal of Infectious Diseases, 2016:213.
- [3] Coltart et al, "The Ebola outbreak 2013-16: old lessons for new epidemics," Philosophical Transactions of the Royal Society B 372: 20160297.
- [4] Simonsen et al, "Global Mortality Estimates for the 2009 Influenza Pandemic from the GLaMOR Project: a Modeling Study," PLoS Med 10(11), 2013.
- [4a] Van Kherkove et al, "Estimating age-specific cumulative incidence for the 2009 influenza pandemic: a meta-analysis of A(H1N1)pdm09 serological studies from 19 countries," Influenza Journal January 2013.
- Global infections ~943 mn based on case fatality rates from 19 countries: Australia, Canada, China, Finland, France, Germany, Hong Kong, India, Iran, Italy, Japan, Netherlands, New Zealand, Norway, Reunion Island, Singapore, UK, US, Vietnam.
- [4b] Wong et al, "Case fatality risk of influenza A(H1N1pdm09): a systematic review", Epidemiology, November 2013 24[6].
- [4c] Kelly, "The classical definition of a pandemic is not elusive," Bulletin of the WHO, 2011: 89:54-541.
- [5] Lai et al, "Global epidemiology of avian influenza A(H5N1) virus infection in humans, 1997 – 2015: a systematic review," Lancet Infectious Diseases, 2016 July 16(7).
- [6] Juliano et al, "Estimates of global seasonal influenza-associated respiratory mortality: a modelling study," Lancet. 2018 March 31; 391(10127): 1285–1300.
- [7] Valleron et al, "Transmissibility and geographic spread of the 1889 influenza pandemic," PNAS 2010 107(19).

2019 Recap: Performance & Costs

2020 Asset Allocation



2019 Performance - Core Fund

Gross of fees as of Dec. 31, 2019

19.9%

Benchmark: 19.2%

Net Excess Value Added (NEVA): \$375.2 Million

5-Year

7.8%

Benchmark: 7.5%

NEVA \$553.8 Million

10-Year

8.6%

Benchmark: 8.1%

NEVA \$1.9 Billion

2019 Performance – Variable Fund

Gross of fees as of December 31, 2019

28.6%

Benchmark: 28.3%

NEVA: \$13.4 Million

5-Year

9.8%

Benchmark: 9.7%

NEVA: \$6.5 Million

10-Year

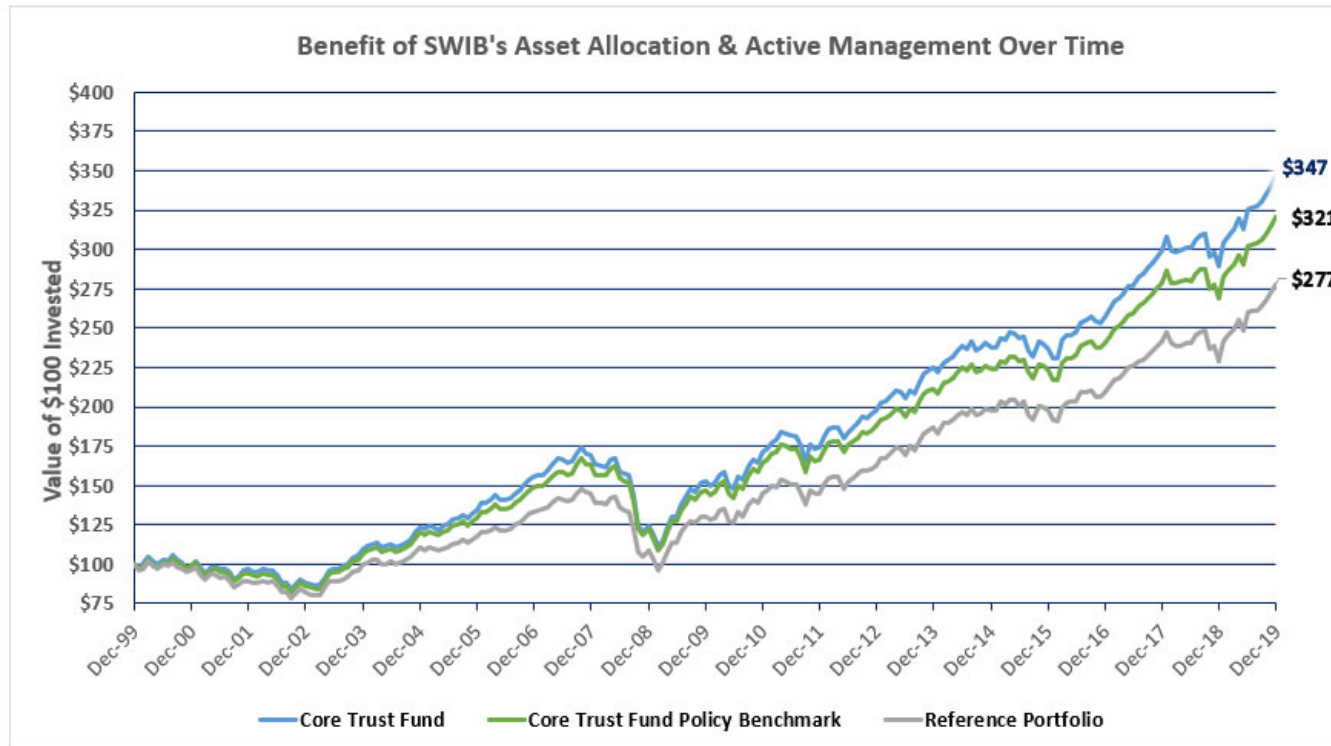
11.2%

Benchmark: 11.0%

NEVA: \$58.5 Million

Performance vs. 60/40 Reference Portfolio*

December 1999 to December 2019



- Core Trust Fund Return outperforms the 60/40 Reference Portfolio Return by 25% (cumulative) over a 20 year time period.
- Based on CTF market value as of December 1999 assuming no contribution or withdrawals, this equates to \$37.2 billion excess value added above the Reference Portfolio.

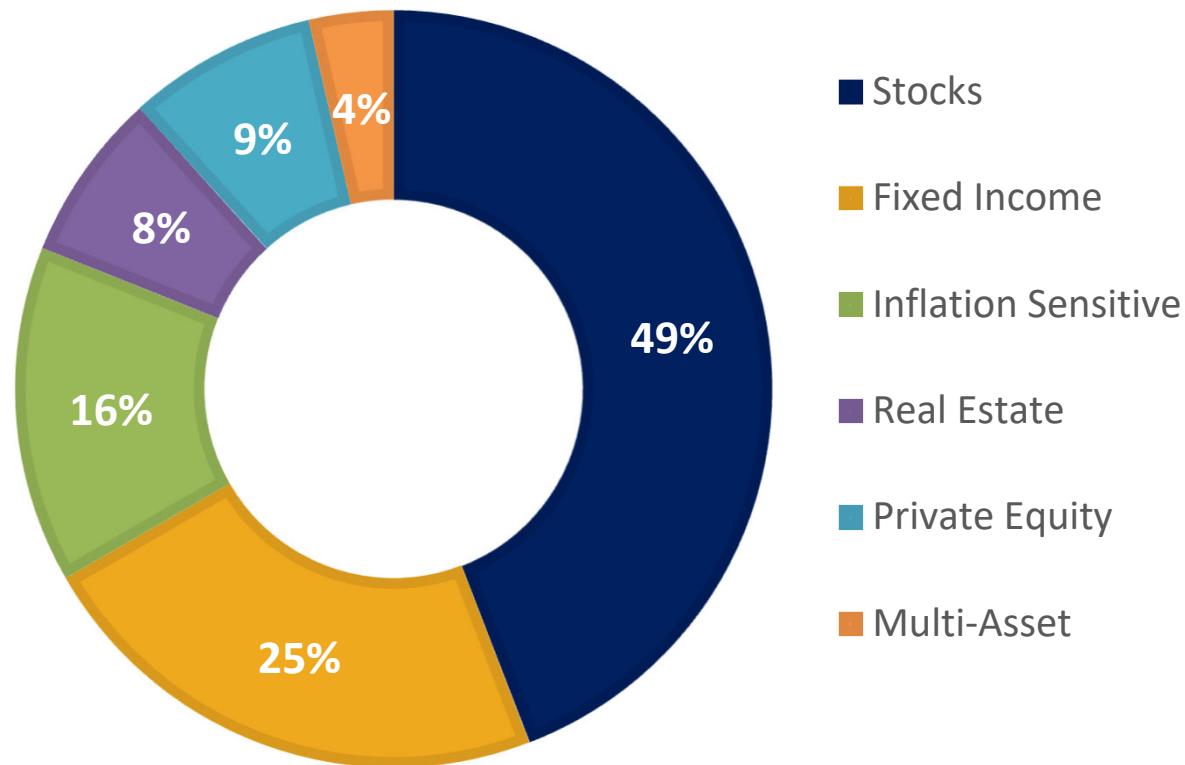
| Reference Portfolio 20 Year Dollar Return* | Additional Policy Portfolio Return Above Reference* | Additional Active Portfolio Return* | Total Core Trust Fund Dollar Return* |
|--------------------------------------------|-----------------------------------------------------|-------------------------------------|--------------------------------------|
| \$147.5 Billion | +\$23.3 Billion | +\$13.9 Billion | = \$184.7 Billion |

*Fixed Income component of the Reference Portfolio changed from WGBI (global) to Bloomberg Barclays Gov't/Credit (domestic) following the October 2019 Board Workshop.

**Based on CTF market value as of December 1999 assuming no contributions or withdrawals.

Core Fund Asset Allocation Targets

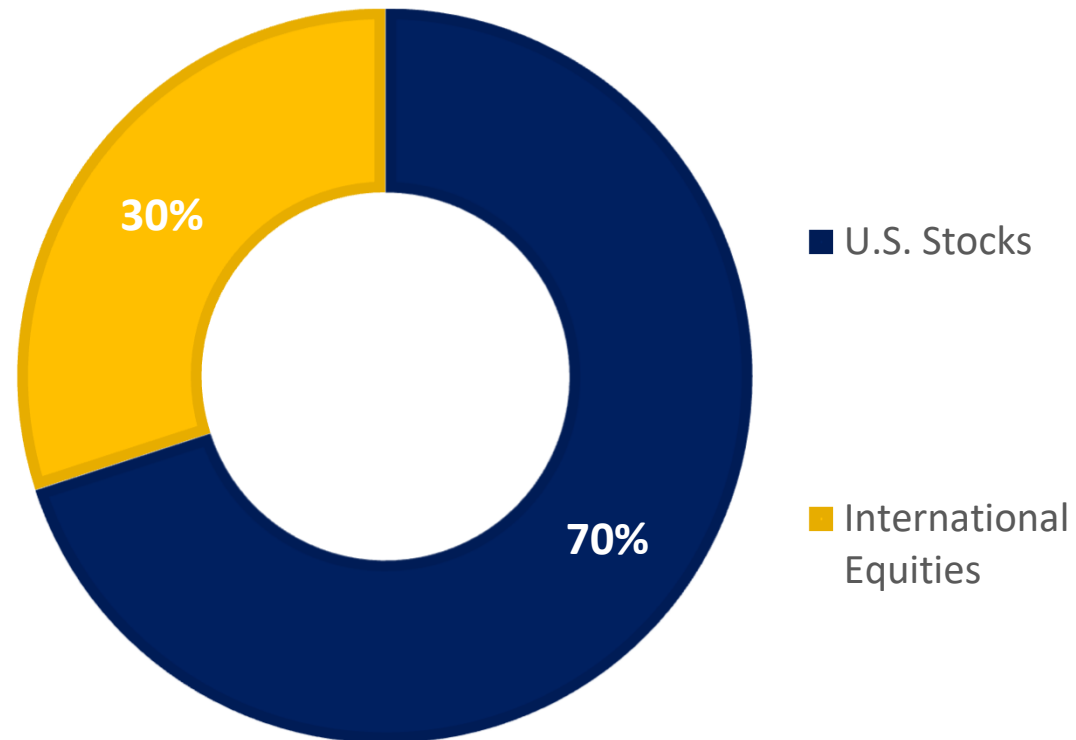
2020



Totals exceed 100% due to SWIB's overall leverage of Core Fund assets. SWIB's actual asset allocation may vary up to +/- 6% from the targets shown above.

Variable Fund Asset Allocation Targets

2020



Core Fund Policy Portfolio

Broad Opportunity Set with Policy & Economic Leverage

| Asset Class | Dec 31, 2019 | Dec 31, 2009 |
|----------------------------------|------------------|------------------|
| Public Equity | 49.0% | 55.3% |
| Public Fixed Income | 24.5% | 27.0% |
| Inflation Sensitive | 15.5% | 3.0% |
| Multi Asset | 4.0% | 4.0% |
| Real Estate | 8.0% | 4.0% |
| Private Equity | 9.0% | 6.7% |
| Cash | 0.0% | 0.0% |
| Economic Leverage | -5.5% | 0.0% |
| Hedge Funds, Alpha Overlay | 5.5% | 0.0% |
| <u>Policy Leverage</u> | <u>-10.0%</u> | <u>0.0%</u> |
| Total | 100% | 100% |
| EQ / FI Factor Allocation | 64% / 46% | 66% / 34% |

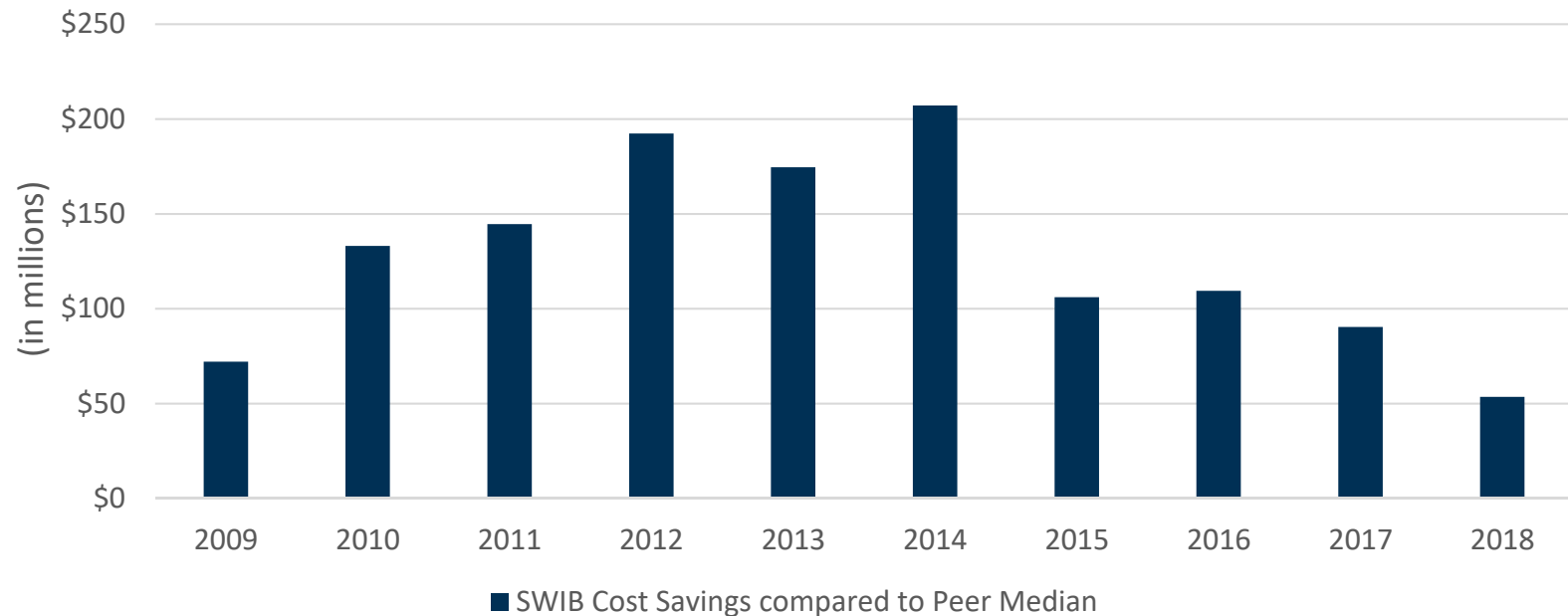
Source: Dec 2019 Board Meeting, Dec 2019 Exposure Report, Dec 2009 AASPE Report

SWIB Saved \$1.3 Billion vs. Peers

2009-2018

SWIB's cost savings advantage has declined in recent years as more of our peers have started adopting our lower cost approach, including more internal management.

SWIB Cost Savings vs. Peers*



*This analysis compares SWIB's savings vs. the peer group median costs for every \$100 under management and multiplies that average savings by SWIB's median assets under management.



Internal Management Is Cost Effective

SWIB's cost for internal active management is multiples lower than the cost for external management.

2018

| Public Market Asset Type (active strategies) | Internal Mgmt Cost (bps) | External Mgmt Cost (bps) |
|-------------------------------------------------|-----------------------------|-----------------------------|
| Global Large Cap Equity | 12.0 | 60.4 |
| Small Cap Equity | 17.0 | 60.1* |
| Gov't/Credit Domestic Fixed Income | 8.2 | 13.8 |
| Global Fixed Income | 8.5 | 30.9* |

** External costs represent the median cost for SWIB's CEM public fund peers for asset classes that SWIB does not manage externally*

Data source: CEM Benchmarking, Inc. 2018 Report
100 bps equals 1 percent

Advanced Degrees of SWIB Staff

As of 11/30/2019

| Degree Type | # of Employees |
|------------------------------------------|----------------|
| Masters of Business Administration (MBA) | 55 |
| Masters Degree other than MBA | 36 |
| Juris Doctor Degree (JD) | 8 |
| Doctor of Philosophy (PhD) | 7 |
| Chartered Financial Analyst (CFA) | 56 |
| Certified Public Accountant (CPA) | 20 |
| TOTAL ACCREDITATIONS | 182 |

Market Review

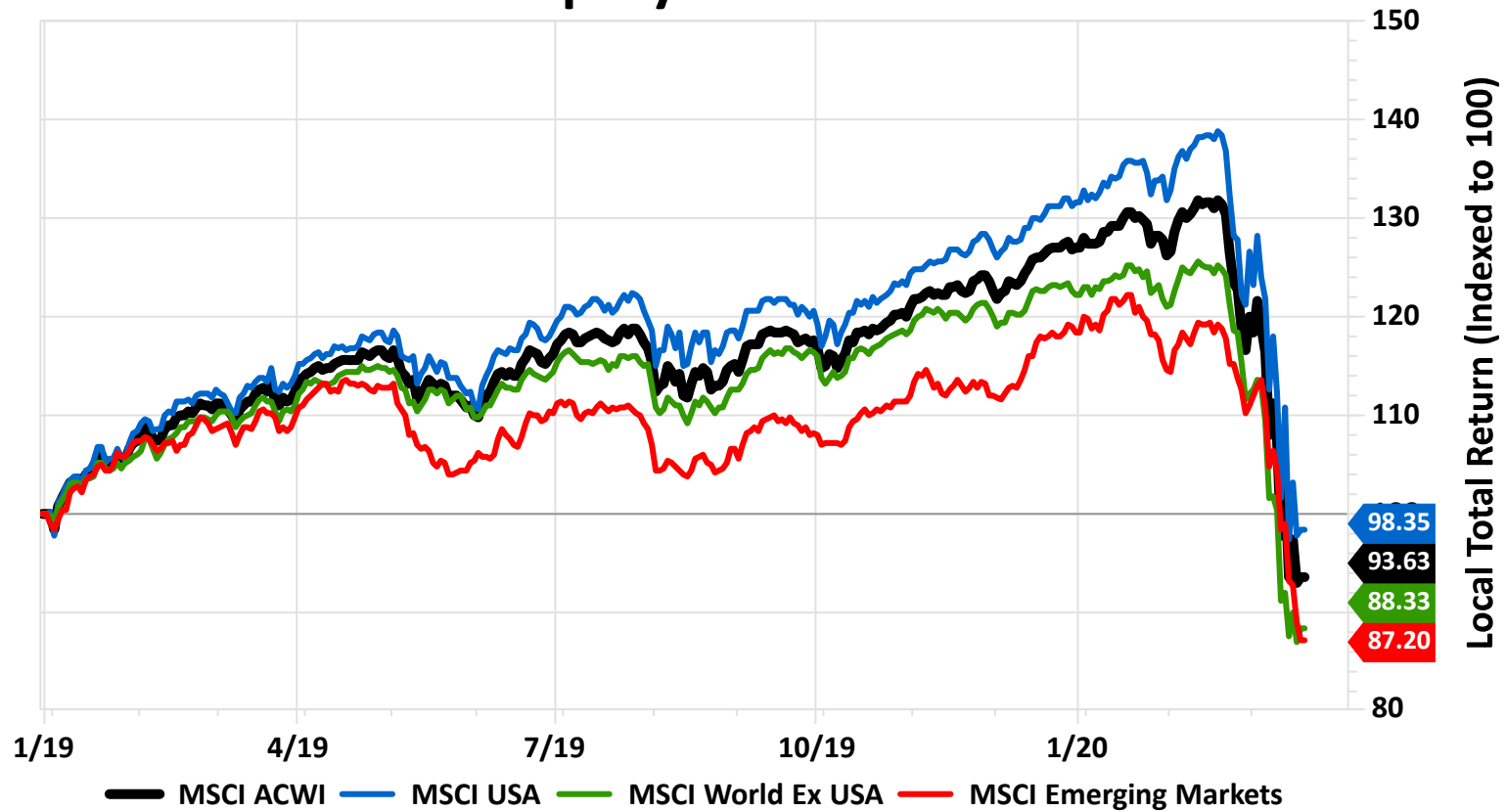


Global Equities - Performance

Virus concerns impact Q1.

03/20/2020

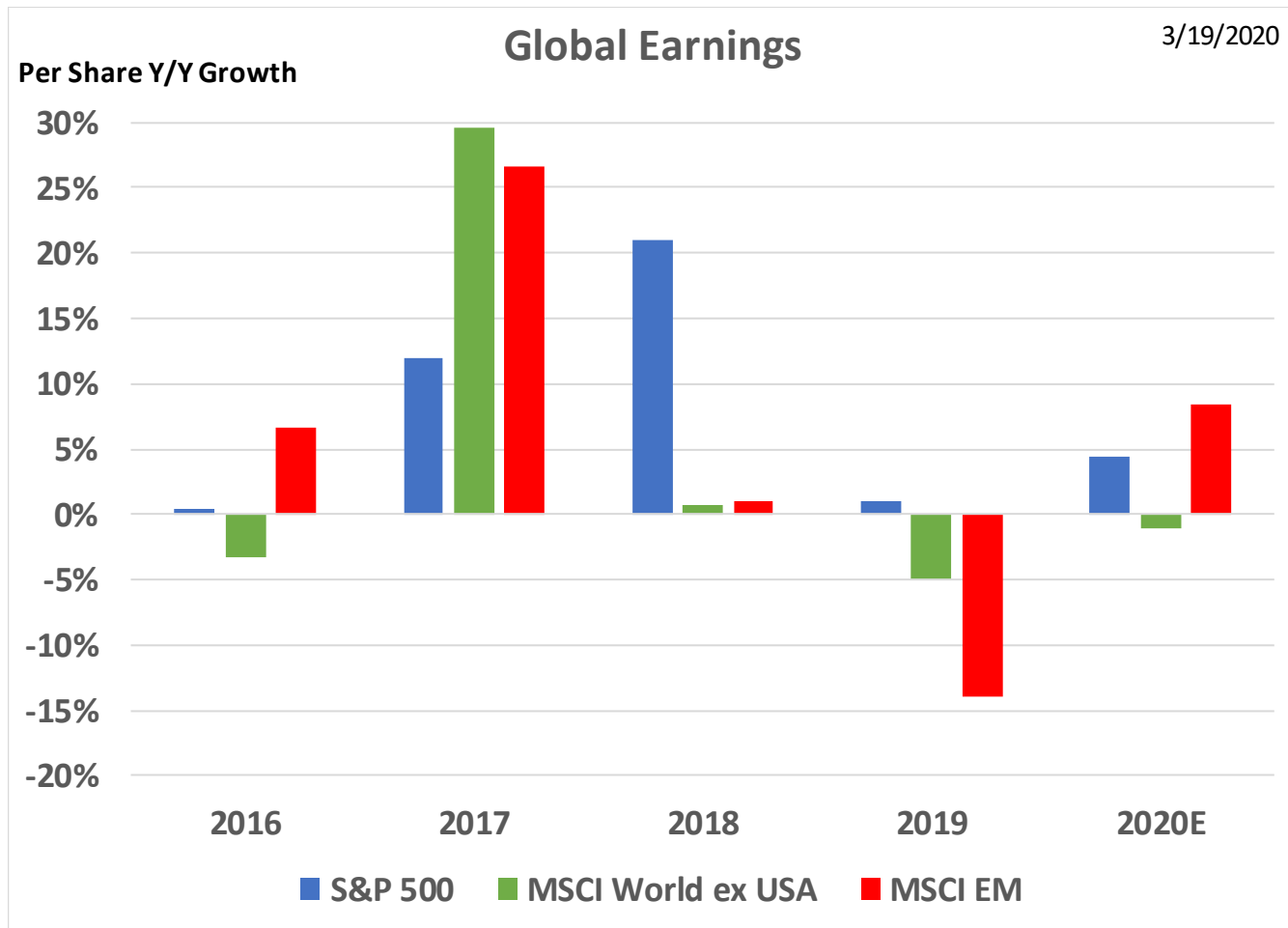
Local Equity Performance



Source: FactSet

Earnings Growth

Evolving growth forecasts remain positive for US and EM.



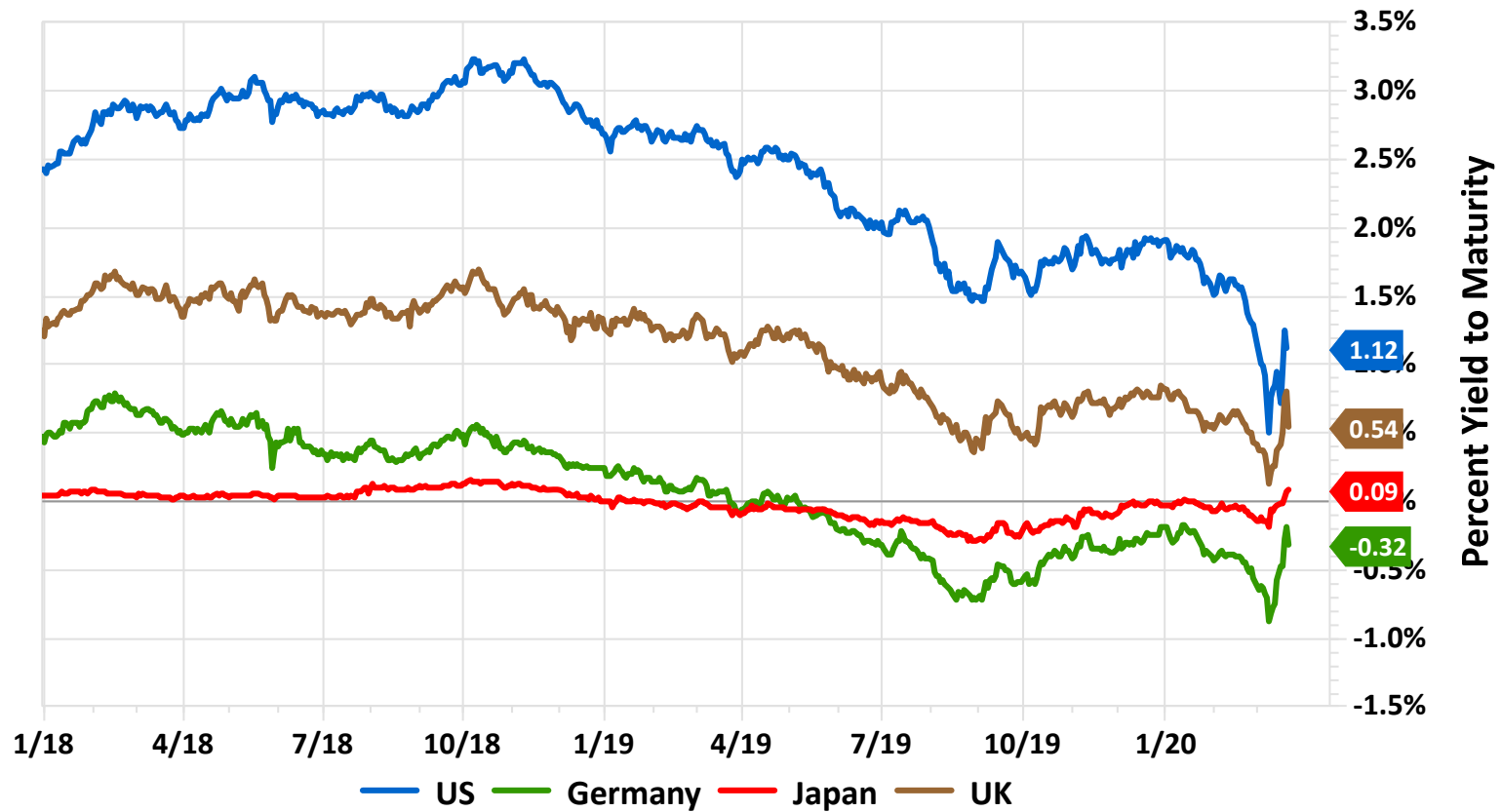
Source: FactSet

Global Bonds

Yields are volatile in Q1 due to COVID concerns and liquidity.

03/20/2020

10-Year Government Bond Yields



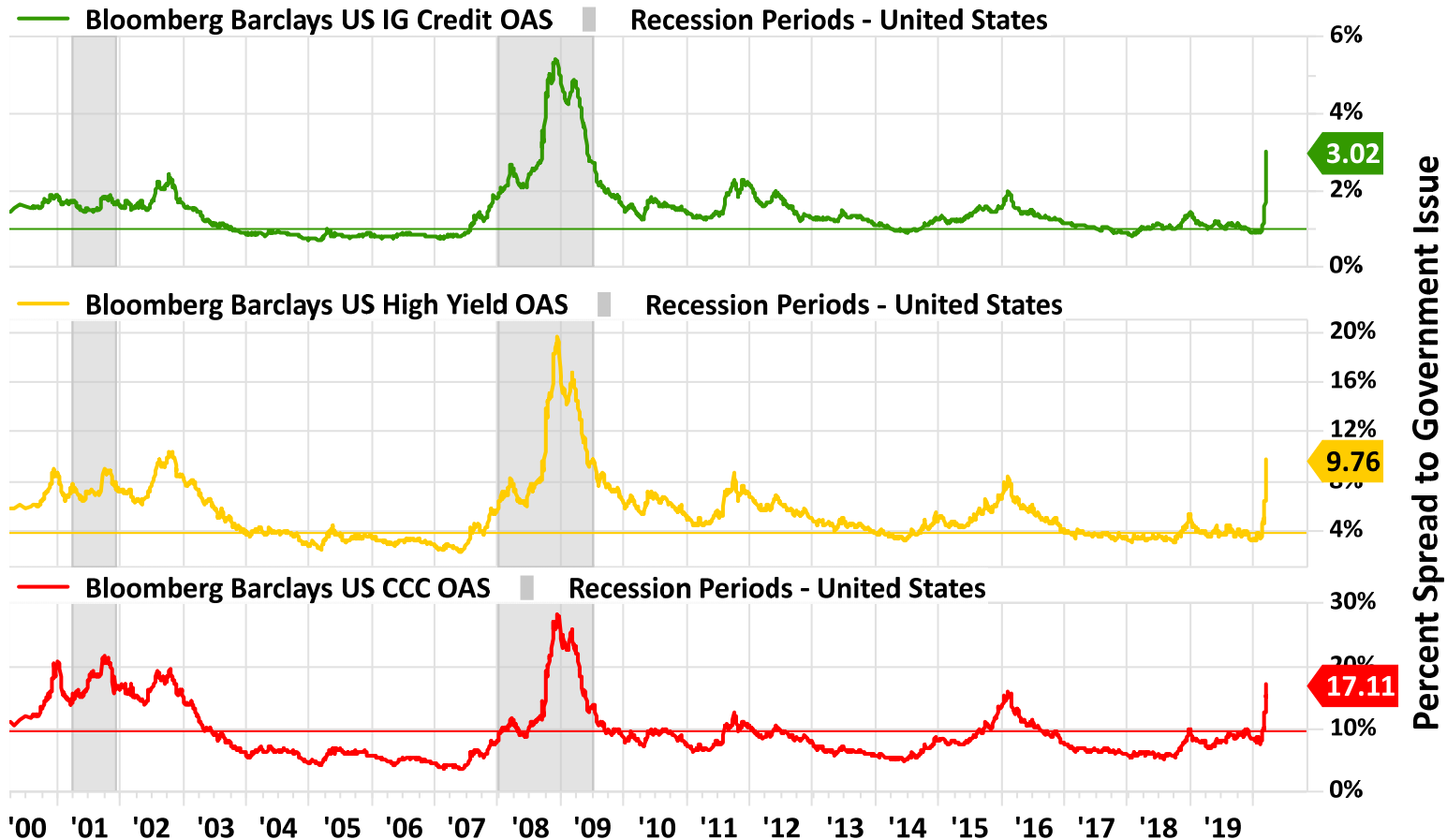
Source: FactSet

Credit Sectors

Spreads have widened in Q1.

Historical Credit Spreads versus Current Level

03/20/2020



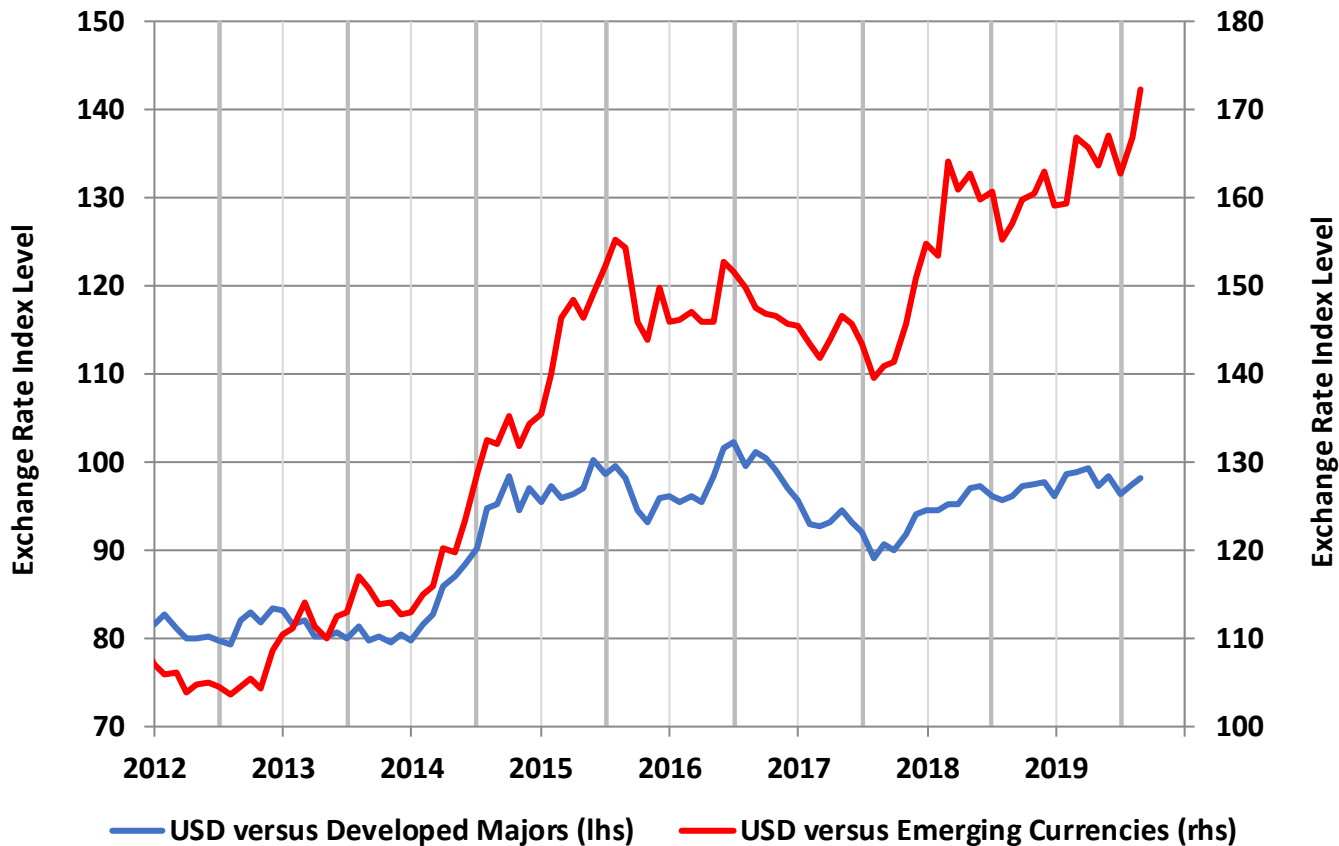
Source: FactSet

Currency Performance

Emerging currencies have weakened in Q1.

Foreign Exchange Rates

Updated: 03/20/2020



Source: Bloomberg, DXY Index, JPM Emerging Markets Currency Index (Inverted)

U.S. Inflation

Inflation expectations markedly lower.

US 5 Year Breakeven Inflation

Updated: 03/20/2020



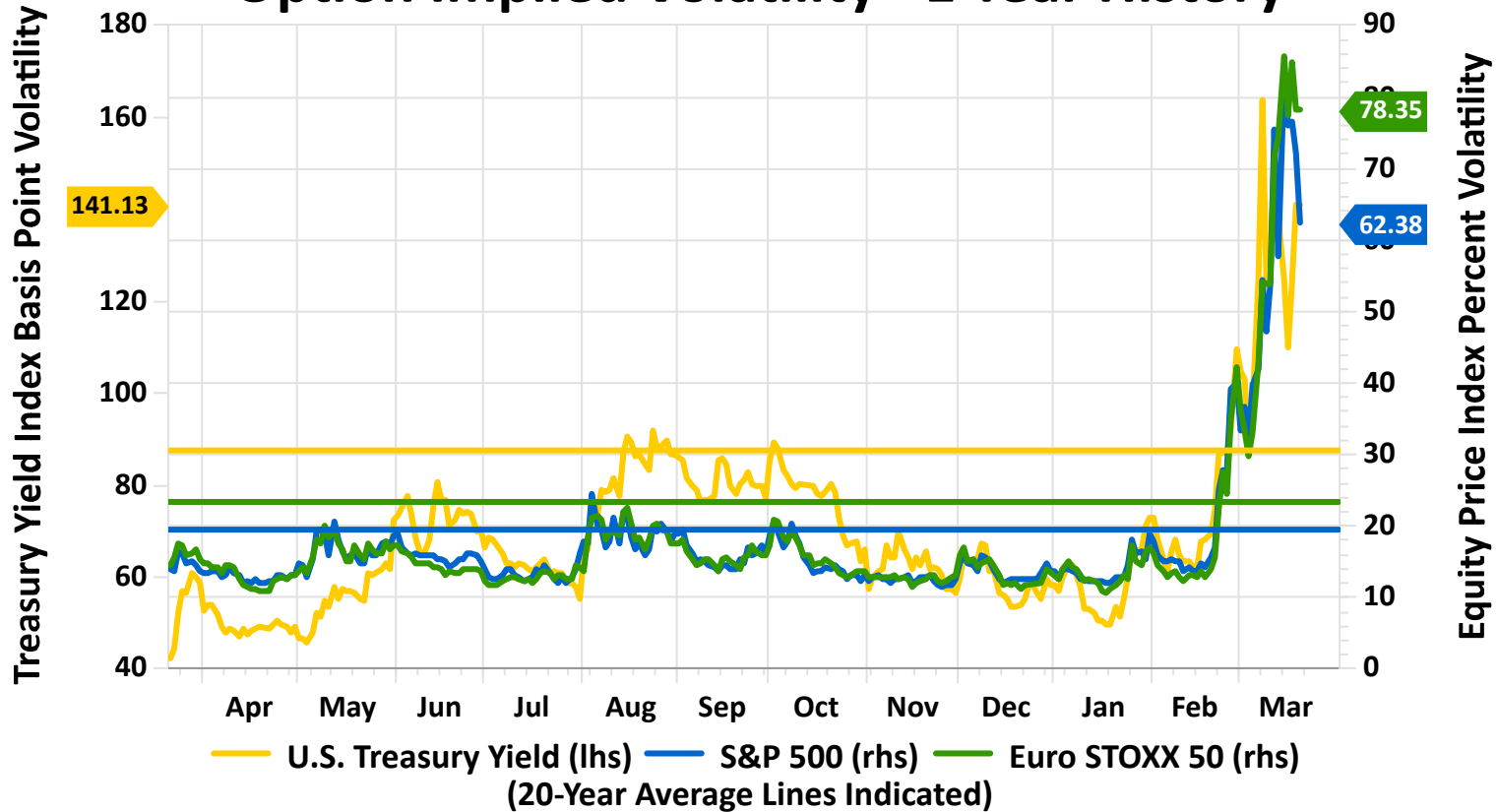
Source: Bloomberg

Volatility

Virus impacts both global supply chains and demand.

03/20/2020

Option Implied Volatility - 1 Year History



Source: FactSet, Merrill Lynch MOVE, CBOE VIX, Euro Stoxx 50 VSTOXX

Thank You



(800) 424-7942



www.swib.state.wi.us



info@swib.state.wi.us



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