

Knightian Uncertainty as a Potential Driver of Recent Equity and Bond Market Movements

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The current coronavirus pandemic can be characterized as a situation of ambiguity or Knightian uncertainty: investors have limited information about the environment and, hence, lack the confidence to assign probabilities to all relevant events.¹ Will the coronavirus be contained or not? How many people will become infected? Will the recovery be V-shaped, U-shaped, or L-shaped? While these outcomes can certainly be described, they cannot be accurately assigned probabilities. Hence, investors are facing a large amount of an ambiguity about future growth and inflation, which is reflected in an increase in GDP and inflation forecast dispersions (**Charts 1 and 2**), the spike in the VIX, and the spike in the 10-Year U.S. Treasury Note Volatility Index.

In a world of Knightian uncertainty, where people are unable to put probabilities on certain states (and they are ambiguity averse), asset prices reflect the worst-case belief of investors. This note tries to reconcile the following movements in equity and bond markets since January 2020 with a framework of Knightian uncertainty and ambiguity aversion:

- Both bond yields and equity prices have declined significantly,
- The correlation between returns on bonds and returns on equities (and hence, bond betas) has fallen dramatically (**Chart 3**).
- Canadian and U.S. nominal yield curves have switched from inverted to upward-sloping starting in March (**Chart 4**).

The note concludes by discussing some potential policy implications if financial conditions, in part, are driven by Knightian uncertainty caused by the coronavirus.

The drop in equity prices and bond yields, as well as the recent sharp drop in stock/bond correlation (or bond betas), are consistent with an increase in Knightian uncertainty ([Zhao 2017 JFE](#) and [Zhao 2020 AERI](#)).² That is, given the substantial amount of Knightian uncertainty, investors' worst-case beliefs of growth and inflation are much lower than a rational belief or mean/median forecast. The extreme movements in the current markets are likely pricing-in investors' worst-case expectations. Investors sell off equities because of their extreme pessimistic growth expectations and buy bonds because of their extreme low inflation expectations.

Knightsian uncertainty can help explain why US and Canada nominal yield curves switched from inverted to upward-sloping starting in March (**Chart 4**). We argue that, currently, short-run Knightian uncertainty

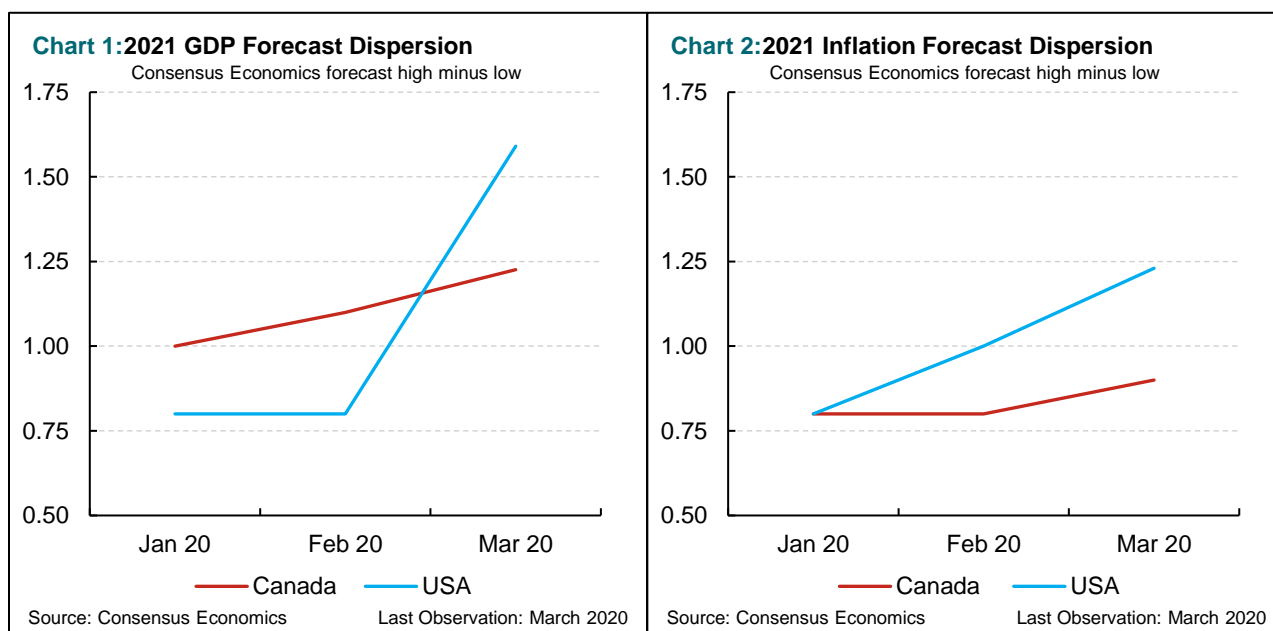
¹ As opposed to quantifiable risk where there is a probability distribution to guide choice. Ambiguity or Knightian uncertainty refers to the situation where investors lack the confidence to assign probabilities to all relevant events.

² While these equity and bond price movements can be explained by other models, these other models have a more difficult time explaining a yield curve that is upward-sloping most of the time. One popular interpretation for the negative correlation between equity and bond prices (or negative bond betas) is that inflation is good news for future growth (true for the U.S. after 2000) and Treasury bonds are a hedge to aggregate risks (see, for example, [David and Veronesi \(2013\) JPE](#); [Campbell, Sunderam and Viceira \(2019\) JPE](#); [Song \(2017\) RFS](#)). However, [Zhao \(2020\) AERI](#) shows that this approach suffers a fundamental problem that it implies a downward-sloping nominal yield curve for the post-2000 period (it is upward-sloping in the data).

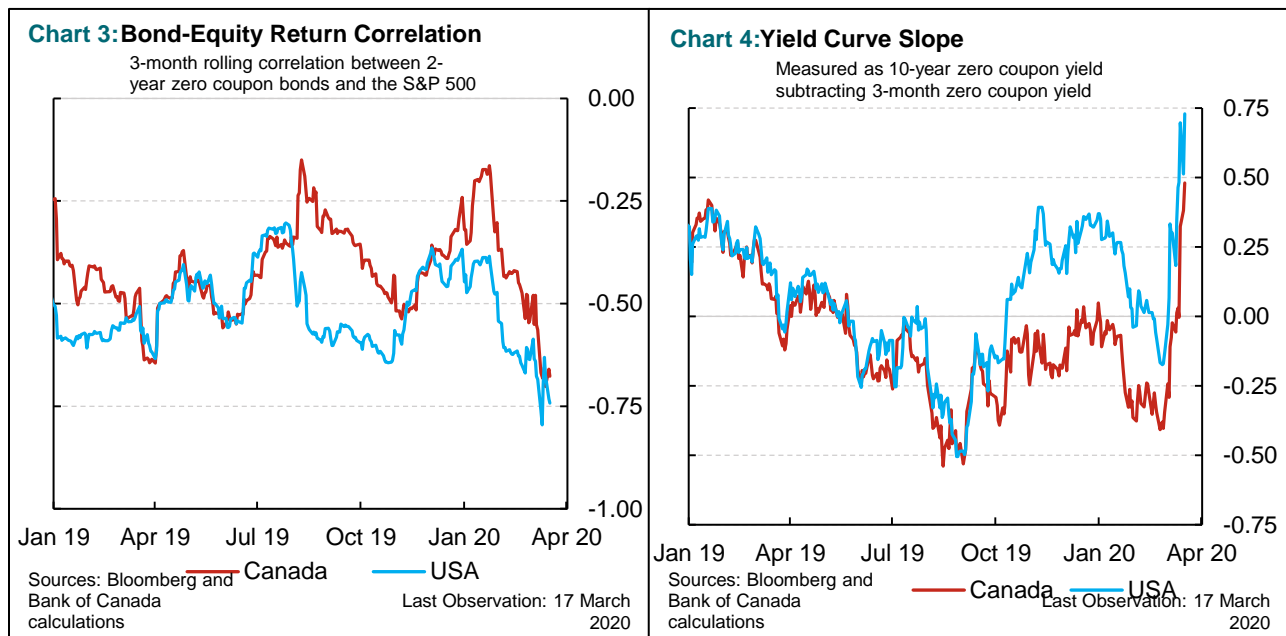
is much larger than for the long-run, due to the coronavirus. Investors' worst-case expectations of the short-run is much lower than that of the long-run, hence short-term yields are pushed down by more than the long-term yields. Therefore, we are having an upward-sloping yield curve now ([Zhao 2020 AERI](#) describes this mechanism in detail).

Policy Implications

If financial conditions are driven, in part, by Knightian uncertainty, financial conditions will only start to improve once the size of the Knightian uncertainty starts to decrease. Central bank liquidity provision and unconventional policies can help prevent the extreme pessimistic behavior in financial markets from propagating into the real economy by reducing unnecessary frictions. As well, fiscal policies can help alleviate the worst-case scenario by eliminating tail outcomes. However, regardless of the policy response some ambiguity will likely remain until the pandemic becomes more contained so the effects of Knightian uncertainty on financial conditions (i.e., worst-case pricing) will likely remain until that becomes the case.³



³ One may conjecture that Knightian uncertainty diminishes as a function of time relative to $t=0$ (the catalyst), all else equal. However, this is not the case, especially this time. Short-run ambiguity will alleviate only when we have a better understanding of the coronavirus (effective medicine or vaccine, the pandemic becomes more contained, etc.). At each point in time, the size of ambiguity is smaller for the longer horizon (for example, this might be due to central bank credibility – people believe that the central bank can control inflation and hence there is not much ambiguity in long run inflation). But as time passes, the short-run ambiguity does not become smaller (because the long-run ambiguity does not materialize).



References

Campbell, John Y, Carolin Pflueger, and Luis M Viceira. 2019. "Macroeconomic Drivers of Bond and Equity Risks." Forthcoming at Journal of Political Economy

David, A., Veronesi, P., 2013. What Ties Return Volatilities to Fundamentals and Price Valuations? Journal of Political Economy 121, 682–746.

Song, Dongho. 2017. "Bond Market Exposures to Macroeconomic and Monetary Policy Risks." The Review of Financial Studies, 30(8): 2761{2817.

Zhao, Guihai. 2017. "Confidence, Bond Risks, and Equity Returns." Journal of Financial Economics, 126: 668–688.

Zhao, Guihai. 2020. "Ambiguity, Nominal Bond Yields, and Real Bond Yields." Forthcoming at American Economic Review: Insights.