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Addendum 4 to the CRI Technical Report (Version: 2017, Update 1)

This addendum presents a number of special treatments for four input variables (i.e., covariates) in the CRI PD model. The treatments are part of the ongoing effort to improve the predictive power of the CRI PD model documented in Technical Report Version: 2017, Update 1. The four variables are:

- Stock index return
- Size
- M/B
- Liquidity ratio

The treatments are motivated by an extraordinarily subdued PD in recent months for Venezuela, a debt-ridden country now facing a severe economic crisis. The counter-intuitive phenomenon is mainly due to the numeric improvement in the four variables above, which is fundamentally caused by the inflated market capitalization of individual firms as well as the stock market as a whole under the economy's hyperinflation (see Figure 1). To remove such distortion in currency value, for Venezuela and other economies, we adjust the four variables in the following way:
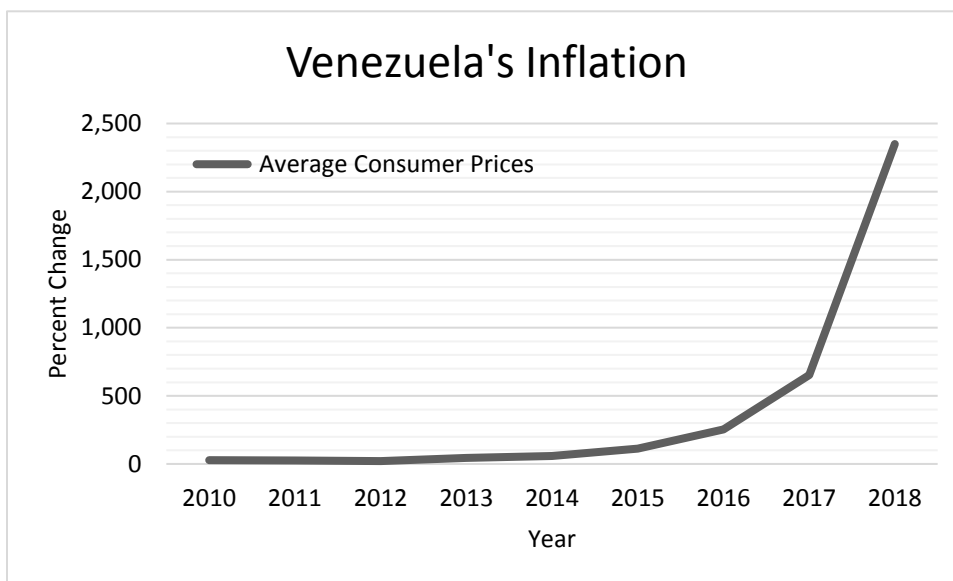

Figure 1. Venezuela's hyperinflation in percent changes. Source: International Monetary Fund World Economic Outlook Database, October 2017 (http://www.imf.org/external/pubs/ft/weo/2017/02/weodata/weoselgr.aspx).

I. Unify currency for stock index in each calibration group

In the CRI PD model, stock index return is a business-cycle indicator to help capture the macro financial impact on the CRI PDs. However, the hyper-inflated stock index return contains lots of

noises and therefore does not represent the macro financial condition well. To remove the possible distortions in the local currency for Venezuela and for all other economies, we now unify the currency for each calibration group of economies as follows:

- China — CNY
- India — INR
- Asian Developed — USD
- Emerging Market — USD
- Europe — Euro
- North America — USD

II. Unify currency for calculating market capitalization and refine the size measure

In addition to unifying the currency for firm's market capitalization, we also refine the size measure as follows:

SIZE= log (Each firm's market cap. / Economy's market-cap median over the past one year).

In the previous CRI PD model, the Economy's market-cap median is calculated with reference to a specific date in the history. With this change, the new size measure is interpreted as "How big is a firm *relative to* the historical median economy size over the past year?"

III. Adjust M/B ratio

The M/B ratio, one of the firm-specific attributes for the CRI PD model, signals the degree of mis-valuation or future growth potential. Its original definition is:

Individual firm's M/B = (Market capitalization + Total liabilities) / Total assets.

To bring down the high volatility of the M/B ratios caused by hyperinflation, we adopt "relative" M/B ratios in the way of dividing the individual firm's M/B by each economy's median M/B:

Relative M/B = Individual firm's M/B / Economy M/B median.[1]

Here, Economy M/B median is taken from the same day that individual M/B is calculated. By doing so, we are able to examine the degree of mis-valuation or future growth potential *relative to* economy median level.

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[1] The relative M/B ratios are not affected by the currency adjustment through market cap. as mentioned in Section II. The currency adjustment also applies to Total liabilities and Total Assets used in the M/B ratio, so the adjustment can be offset each other.

IV. Refine liquidity ratio

The liquidity ratio is associated with the capability to make a payment. Its original definition is as follows:

Liquidity ratio = (Cash + Short-term investments) / Total assets.

In a Venezuelan company's financial statement, "Cash" and "Short-term investment" (numerator of the liquidity ratios) are most likely denominated in local currency with ever-changing intrinsic value, whereas the "Total assets" are not necessarily marked to market in a timely fashion. This can lead to a soaring liquidity ratio at least over the short term. To make the numerator and denominator suffer less from the information mismatch due to timing, we refine the liquidity ratio as "log (Current assets / Current liabilities)" for non-financial firms, which widely report the two current items in their financial statements. For financial firms, however, we use "log ((Cash + Short-term investments) / Total assets)" mostly because the cash and short-term investments are more readily available in their financial statements. In the model calibration, we allow the coefficients on liquidity ratio (level and trend) to be sector-specific (financial vs. non-financial).

References

Credit Research Initiative, 2017, "NUS-RMI Credit Research Initiative Technical Report Version: 2017 update 1," National University of Singapore.