IESE I3E Economic Uncertainty Index

Technical Note

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April 3, 2025

The IESE Economic Uncertainty Index (I3E) is constructed using the daily closing prices of four financial variables for each of the countries covered:

- Domestic equity index

- Domestic 10-year government bond price

- Domestic exchange rate

- International Brent crude oil price

Daily growth rates (or returns) of these four economic-financial series are calculated as:

$$y_i(t) = \frac{x_i(t) - x_i(t-1)}{x_i(t-1)}, \quad \text{for } i = 1, 2, 3, 4$$

Next, the volatility of each series is calculated using exponential smoothing of the squared returns $y_1(t), y_2(t), y_3(t), y_4(t)$:

$$z_i(t) \quad \text{for } i = 1, 2, 3, 4$$

This is the method followed by J.P. Morgan (Riskmetrics) to compute volatilities.

Then, we define:

$$w_i(t) = \log(z_i(t))$$

for i = 1, 2, 3, 4

For the normalization, let μ_i and σ_i be the mean and standard deviation of $w_i(t)$ over the period 2014-2024. The standardized values are:

$$s_i(t) = \frac{w_i(t) - \mu_i}{\sigma_i}$$

The composite standardized series is:

$$S(t) = \sum_{i=1}^{4} \frac{w_i(t) - \mu_i}{\sigma_i}$$

Its standard deviation σ is:

$$\sigma = \sqrt{4 + 2\sum_{i<j}\rho_{ij}}$$

where ρ_{ij} is the correlation between $w_i(t)$ and $w_j(t)$.

The global uncertainty index is then defined as:

$$I(t) = 100 + \frac{30}{\sigma}\sum_{i=1}^{4}\frac{w_i(t) - \mu_i}{\sigma_i}$$

For the reference period, $\sigma \approx 3$.

Partial Indices

Similarly, we define the four partial indices as:

$$I_i(t) = 100 + 30 \cdot \frac{w_i(t) - \mu_i}{\sigma_i}, \quad \text{for } i = 1, 2, 3, 4$$

These correspond to:

- $I_1(t)$: Uncertainty index for equity index,

- $I_2(t)$: Uncertainty index for exchange rate,

- $I_3(t)$: Uncertainty index for Brent crude oil,

- $I_4(t)$: Uncertainty index for 10-year government bond.

Each of these indices has a mean of 100 and a standard deviation of 30. It is important to note that the global index $I(t)$ is **not** the arithmetic mean of the four partial indices.