

Economic Scenario Generator (ESG) Stylized Facts for Equities

Economic Scenario Generator Work Group (ESGWG)



AMERICAN ACADEMY of ACTUARIES

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National Association of Insurance Commissioners (NAIC) Life Actuarial (A) Task Force (LATF)

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Regulators provided feedback on the ESGWG's 8/9/22 presentation to LATF

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- The Academy would like to thank regulators for providing feedback on this important topic.
- Edits were suggested for stylized facts #2 and #5.
 - The ESGWG agreed with the suggested edits (reflected in red in a following slide).
- A new stylized fact was suggested to address the increased correlation between equity indices frequently seen in bear markets.
 - The ESGWG agreed and added a new stylized fact #9 to this effect (in red).
- There was feedback stating the usefulness of including a slide with the “goals related to equity scenarios” that Conning and the NAIC presented to LATF on 12/17/20.
 - The ESGWG agreed and added such a slide directly after the revised stylized facts that follow.

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- There were questions on stylized facts #2 and #4 (positive equity risk premium, and impact of initial market conditions).
 - Regulators noted that at this point stylized facts (and acceptance criteria) should be able to be consistent with different ERP theories, including theories based on a constant mean equity risk premium above interest rates and theories based on a constant mean equity return (i.e., one that exceeds the mean reversion point for interest rates).
 - The field test included scenario sets modeled under both of the above approaches.
 - LATF has indicated a desire to hold off on hearing additional content and having additional discussion on these stylized facts until field test results are available.

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Stylized facts for equities

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1. Equity indices (indeed, all asset classes) tend to exhibit **consistent risk/reward relationships** over long time horizons.
2. Cumulative equity returns tend to exceed the compounded risk-free rate (positive **observed equity risk premium**) over long time horizons, but over short time horizons the **observed** equity risk premium fluctuates due to several factors and can be negative.
3. Equities **fluctuate between bull and bear markets** (bubbles tend to burst)—markets can experience significant losses but eventually tend to **move back into positive territory** (negative cumulative equity returns become less likely over longer time horizons).
4. Cumulative equity returns **over long time horizons are not materially impacted by initial market conditions**.
5. The **volatility of equity returns varies over time but has a strong tendency to quickly revert to normative levels**. This allows for both extreme gains and extreme losses over short time periods (i.e., the distribution has fat tails, or **positive kurtosis**). Furthermore, the **volatility of equity returns is higher in bear markets**. This increases the probability of extreme losses relative to extreme gains (i.e., the distribution has a longer left tail, or **negative skewness**).

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Stylized facts for equities (continued)

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6. Equity markets contain **pathwise dynamics** over long time horizons that aren't present in the distribution of single-period returns. Future equity scenarios should have reasonable distributions of cumulative equity returns over long time horizons (e.g., 10, 20, 30 years), especially since these distributions are key to the performance of long-duration life and annuity products.
7. Future equity scenarios should include events that are **plausibly more extreme than history**.
8. Equity returns have both a **price and dividend component**, and they behave differently—dividend returns tend to be more stable than price returns.
9. Returns between different equity indices **are generally positively correlated over long time horizons**. This correlation may increase sharply in bear markets, but it tends to revert to normative levels in a short period of time.

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Goals related to equity scenarios from Conning/NAIC 12/17/20 presentation to LATF

Goals relating to equity and bond fund scenarios:

1. Returns should be provided for funds representative of those offered in U.S. insurance products.
2. The ESG should be calibrated using an appropriate historical period.

Goals relating to the equity scenarios:

3. The equity model should have stochastic volatility and the initial volatility should be updated frequently.
4. The ESG should have the ability to generate very large losses and gains in short periods of time (i.e., jumps).
5. Equity scenarios need to reflect the possibility of a very long recovery after a period of losses.
6. There should be higher correlation in the tail scenarios between different equity indices.
7. There should be a link between equity returns and Treasury yields.

- These goals are generally consistent with the stylized facts presented on the prior two slides.
- Note that stylized facts are generally *prioritized* based on the intended application, but the stylized facts themselves are generally independent of the intended application (largely based on historical data, sometimes supplemented with forward looking views).
- Note that stylized facts and their prioritization are generally independent of the model since models differ in their ability to reflect the various market properties described by stylized facts.

Thank You

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