Tilt-Trisk
Matching Methodology
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About 1in1000

1in1000 is an initiative of Theia Finance Labs (originally known as 2° Investing Initiative Germany), a German non-profit think tank specializing in the quantification of climate change risks within the financial sector. Since 2023, 1in1000 has become a joint research initiative between Theia Finance Labs and the University of Oxford Sustainable Finance Group. The joint initiative cooperates on expanding research frontiers in climate stress testing and implementing climate stress testing analytical exercises as well as capacity building with supervisors and central banks around the globe. This methodology approach refers to the 1in1000 Trisk model, which is designed as an asset-based forward looking climate transition stress test.

About tilt

Tilt is an independent venture launched by Theia Finance Labs (formerly known as 2° Investing Initiative Germany). The project is funded by the EU LIFE PASTAX grant, financial institutions, and the philanthropic community. Fostering transparency and credibility, tilt's software empowers EU banks to set up impactful climate strategies in SME lending. It's software enables banks to generate climate SME data, explore the results in a comprehensive way, get a climate strategy for their SME lending portfolio and to find the most vulnerable clients to grant effective climate improvement loans.

This document highlights the matching mechanisms to introduce climate transition shocks calculated by the 1in1000 Trisk model into the tilt database. It also covers the approach for the additional introduction of ecosystem and social risk costs for the tilt SME database.

Tilt-Trisk Matching process

For the matching of Trisk and tilt data, we first need to create suitable Trisk runs. Tilt already has scenario specific datapoints for calculated for their dataset. In particular, they use scenarios from IPR and IEA WEO to calculate additional scenario projection. We can calibrate the Trisk model to run also on WEO and IPR, to allow for further synergies with the merged dataset.

We focus on two different main Trisk runs:

Setting	Model Run #1	Model Run #2
Scenario Provider	IEA	IPR
Baseline Scenario	Announced Policy Scenario	IPR Baseline
Target Scenario	WEO SDS	IPR FPS
Shock year	2030	2030
Discount Rate	7%	7%
Growth Rate	3%	3%
risk free rate	3%	3%
Region	Europe	Global
Carbon Tax	No	No

Figure 1: Model Run Settings

The main difference in the model run is the choice of baseline and target scenario and the region. For the IEA run, we have scenario data available for the region "Europe", which provides more granular and specific data for the European companies in tilt. For IPR, we do not have additional geographies incorporated in the model code, which is why we are running the model on a global region instead.

For the remaining parameters, we keep default model settings and a 2030 shock year. More iterations and model runs with additional shock years could provide more distinct insights about the effect for the SMEs of an earlier or more delayed transition, which we might want to include in future updates.

Tilt also offers a categorization of the data based on country, in particular on France, Germany and Austria. To allow more accurate matching to related transition shock effects on the tilt companies, we further adjust our main model runs by including an filtering of the underlying asset-based data. The asset-based data for Trisk can be modified to only include companies that are operating in specific countries. We can apply these regional filters to get a more precise estimation of the potential transition risk shock for an average company operating in those regions.

In essence, this means that we rerun the two highlighted model runs three times, with each having adjusted country-based production data.

For the matching mechanism, we rely on the tilt sector and subsector columns. This data already contains sectoral and business unit data that we also run in the stress test and have available in the Trisk outputs, which significantly improves the matching process. Second, we match the different runs based on the country location of the underlying company.

The matched outputs are based on average PD estimates, as well as the rate of change of the NPV, calculated based on the aggregated profit data for the underlying companies in the TRISK dataset. With this, we can match the two main model runs to 13,355 different companies operating in three sectors from tilt.

Ecosystem and social cost adjustment

As an additional feature for the merged dataset, we are also introducing the effect of ecosystem and social risk costs on the already implemented Trisk shock for the tilt companies.

We are relying here on the methodology described in the LIFE STRESS 1in1000 report on "How climate stress test may underestimate financial losses from physical climate risks."[1].

Ecosystem Tipping Points

For ecosystem costs, we are relying on ecosystem cost approximations from the WWF and World Bank, which sum up to an ecosystem cost of 2.93%. We assume that these are the estimated reduction in profits a company might face at the stress test end year. [2] We further assume that the cost for ecosystems is linearly increasing starting from the shock year of 2030 and growing then until the total costs calculated for the final year. We then subtract these costs from the aggregated net present values calculated for each business unit and model run, which contain the same profits that also informed the original relative change in NPV calculated original from the Trisk model framework..

Let's break down this approach into different steps, using an example of the WEO run for Germany and the Oil secor.

1. **Calculate the Ecosystem Costs:**

[1] For in depth methodology breakdowns please consult this report. You can access the report on our Life STRESS website under this link.

[2] Original, these are costs on GDP level, which we translate now into firm specific shocks.

As a first step we calculate the ecosystem costs (EcoCosts), by using the previously mentioned ecofactor of 2.93% and the aggregated profits calculated in the IEA scenario for Oil in the year 2040

$$(1)\quad EcoCosts_{t=2040} = ecofactor * Profits_{IEA,Oil,t=2040}$$

2. **Distributing the costs**

   We are assuming that the costs are increasing linearly each year starting from the shock year. To calculate the annual additions, we divide the EcoCosts by the number of years we have after the shock year, which in this case for IEA are 11. The Eco Cost Adjustments reflect then how much the additional costs accumulate to for each year after the shock year.

$$(2)\quad Eco\ Additions = \frac{EcoCosts}{(End\ Year - (Shock\ Year - 1)}$$

$$(3)\quad Eco\ Cost\ Adjustments_t = Eco\ Additions * (t - (Shock\ Year - 1))$$

3. **Adjusting Profits**

   We then adjust the Shock Profits calculated from Trisk by adding the Eco Cost Adjustments for each year.

$$(4)\quad Adjusted\ Profits_{IEA,Oil,t} = Profits_{IEA,Oil,t} + Eco\ Cost\ Adjustments_t$$

4. **Calculating NPV and relative change**

   Finally, we calculate the NPV of the business unit by discounting all aggregated profits and aggregating them. This aggregation will also include a Terminal Value calculated based on the final value of Adjusted Profits.

$$(5)\quad NPV_{eco} = \sum_{t=2030}^{T} \frac{Adjusted\ Profits_{IEA,Oil,t}}{(1+r)^{(t-t0)}}$$

By calculating the %-change in NPV from Baseline to Eco adjusted NPV, we can see the additional impact from introducing these costs.

$$\%Change\ NPV\ with\ ECO = \frac{NPV_{eco}}{NPV_{base}} - 1$$

In this case, the original Trisk shock was -43% and the introduction of ecosystem costs increased this shock to -44%.

Social Risk Costs

For social risk we use the same approach as highlighted above, with the distinction that we are assuming a -12% social risk cost factor, which relies on a study by de Groot et al (2022)[3]. Note that we are assuming a cumulative addition of the two mentioned cost factors, which means that we aggregate the effect of ecosystem costs and social risk costs, giving us a total cost factor of 14.93%.

In the example mentioned above, this would entail an additional valuation risk of 4% compared to our original calculated Trisk shock.

Shock Type	NPV %-change
Original Trisk shock	-43%
Adding Ecosystem Costs	-44%
Adding Ecosystem and Social Costs	-47%

Figure 2: Example Results of Ecosystem and Social Risk Inclusion

Physical Risk Costs

As a final step in the process, we are adding also physical risk costs, espceially through the introduction of climate tipping points. Similar to the Ecosystem and social risk costs, we are again referring to the LIFE STRESS 1in1000 report on "How climate stress test may underestimate financial losses from physical climate risks.". As highlighted in the report, the additional shock is extrapolated from Dietz et al (2021), who estimate the impact on the social cost of carbon through climate tipping points. As in the report, we use the $ change in social cost of carbon to suggest the additional profit reduction in the end year using their central estimate and the tail 10% tail probabiltiy. In this case, this results in a prisk cost fator of 18%, which we apply on the last available observation of aggregted trisk shock profits for each business unit and country selection and for the two scenarios. We then follow the same process as highlighted in the case above. In our case example, this would lead to a -48% NPV change compared to the baseline. Note that this cost is not cumulatively added to the ecosytem and social costs highlighted in the previous section. In a cumulative approach, the additional shock on NPV could be drastically higher.

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[3] De Groot, Olaf, Carlos Bozzoli, Anousheh Alamir (2022) "The global economic burden of violent conflict". Journal of Peace Research. https://journals.sagepub.com/doi/full/10.1177/00223433211046823

Shock Type	NPV %-change
Original Trisk shock	-43%
Adding Ecosystem Costs	-44%
Adding Ecosystem and Social Costs	-47%
Adding Physical Risk	-48%

Figure 3: Total Shock Type and NPV effect overview

Concluding Remarks

In the results calculated for the Tilttrisk integration, the ecosystem and social cost additions can have a varying effect based especially on the type of technology. For high emission intensive technologies we see rather small additional costs, while low emitting techs, like renewable or hydro, are showing stronger impacts. This is due to the fact that high emitting technologies are already phased out drastically in the original Trisk shock. Calculating the cost effect then on the end year profits results in rather low additional eco and social cost effects. This also hold for the integration of physical risk climate tipping points. We believe this to be an interesting finding worth investigating further in future updates.