

To facilitate adoption by actuaries and regulators, we provide the open-source Python package `bnn_levy_actuary`, available at:
https://github.com/anazzaro/bnn_levy_actuary

Installation and Usage

The package can be installed directly from GitHub. To avoid conflicts with preinstalled scientific libraries in managed environments such as Google Colab, we recommend installing without dependency resolution:

```
pip install --no-deps git+https://github.com/anazzaro/bnn_levy_actuary.git
```

Why –no-deps.

The flag `–no-deps` prevents pip from reinstalling scientific libraries (NumPy, SciPy, PyTorch, pandas) that are already provided by managed environments such as Google Colab. Omitting it may overwrite the pre-installed versions and cause incompatibilities (e.g., between PyTorch and TorchVision). After installation, restart the Python runtime so that the new package version is loaded.

Dataset.

The EIOPA-calibrated mortality dataset is distributed separately to keep the wheel lightweight. It must be downloaded and placed inside the package directory. The path to the package directory can be obtained with:

```
import site
```

```
print(site.getsitepackages()[0])
```

Then download the CSV and copy it into the package folder:

```
wget
```

```
https://raw.githubusercontent.com/anazzaro/bnn_levy_actuary/master/DATI_EIOPA_30NOVEMBRE2024.
```

```
csv
```

```
cp DATI_EIOPA_30NOVEMBRE2024.csv SITE_PACKAGES/bnn_levy_actuary/
```

where `SITE_PACKAGES` is the path returned by the previous command.

Reproducing the Results in Google Colab.

The simplest and most reliable way to reproduce the results reported in Section 4.8 is to clone the repository directly into a Google Colab notebook and run the example script as a Python module. The commands below are sufficient. **Note:** in Google Colab, commands starting with `!` are shell commands, and commands starting with `%` are IPython magic commands. If the leading `!` or `%` is lost when copying from this PDF, simply retype it manually.

```
!git clone https://github.com/anazzaro/bnn_levy_actuary.git
```

```
%cd bnn_levy_actuary
```

```
!python -m bnn_levy_actuary.example
```

Alternatively, if the `!` and `%` prefixes cause issues, the following equivalent Python code can be used instead:

```
import os
```

```
os.system('git clone https://github.com/anazzaro/bnn_levy_actuary.git')
```

```
os.chdir('bnn_levy_actuary')
```

```
os.system('python -m bnn_levy_actuary.example')
```

This second version uses only standard Python and avoids any dependency on IPython magic commands, making it fully copy-paste compatible.

Troubleshooting

Four issues commonly arise:

1. **Dependency conflicts.** Always install with `--no-deps`, as explained above.
2. **Missing dataset.** If the script raises `FileNotFoundError`, the CSV has not been copied into the package directory. Follow the download step above.
3. **Runtime not restarted.** Colab may warn that `bnn_levy_actuary` was previously imported. Restart the runtime before testing.
4. **Plot saving on non-Windows systems.** The full `example.py` script may attempt to save a figure to the user's Desktop, which fails on Linux and macOS. This error is cosmetic and occurs after all numerical results have been printed.

Package Structure

The `bnn_levy_actuary` package provides a reference implementation of the core methodology described in this paper. The current version includes:

- The stochastic MLP architecture with Bayesian dropout ($p = 0.3$) and tempered stable Lévy noise ($\alpha = 1.7$, $M = 10$), as described in Section 3.
- Training and evaluation functions implementing the Jensen-Shannon divergence regularization defined in Equation (17).
- Utility functions for loading and preprocessing EIOPA-compliant mortality data.
- Example scripts demonstrating the model's application to reserve estimation.
- Scenario generators for the stress tests presented in Section 4.5.

The package is designed to be modular and extendable, allowing practitioners to adapt the code to their specific needs. Future releases will include additional features as the framework evolves.

Documentation and Support

Documentation is provided in English. The GitHub repository includes a full API reference, example notebooks, and a guide for regulators. Contributions and feedback are welcome via the repository's issue tracker.