

# User Guide for EconBPC – A Tool for Activity-based Monetary Assessment and Visualization of Security and Compliance Measures in Business Processes

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## 1 The Software Artifact EconBPC

The software artifact EconBPC enables the economic assessment and analysis of Business Process Compliance (BPC) utilizing eXtensible Event Streams (XES). A description of the underlying assessment approach, its basic concepts, and its application by means of an example can be found in [1]. Figure 1 is a screenshot showing a part of the EconBPC tool during use. The design principles of EconBPC, the software architecture of the prototype, its implementation as an R application, and the summative evaluation are discussed in [2].

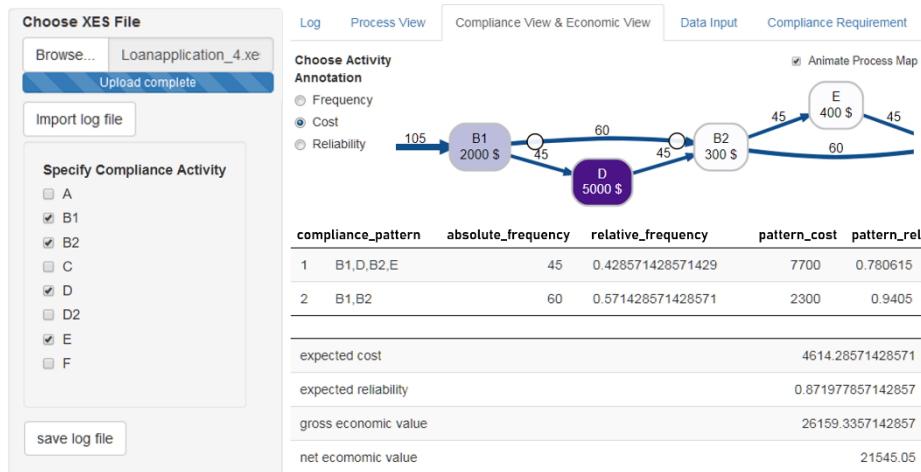


Fig. 1. Screenshot showing a part of the EconBPC tool

## 2 Download EconBPC

EconBPC is an R-based web application that builds on the shiny library [3] (version 1.7.2) and can be used across several platforms. The application and its source code can be downloaded here: <https://bit.ly/2TtKuRE>.

*Note: The application requires an installation of R and has been tested so far with R 3.6.0 and newer versions (up to 4.2.1) on computers running Microsoft Windows 11, 10, 7, XP, as well as Mac OS 10.14 (Mojave).*

## 3 Launching EconBPC via the R Console

Before running EconBPC via the R console (see Fig. 2), the following steps must be performed:

1. Install the latest version of R on your PC.
2. Download EconBPC.zip from the link provided above.
3. Extract the files server.R and ui.R from the zip file and save them in a directory.
4. Start R.
5. Install and load the “Shiny” library using the following commands in the console:

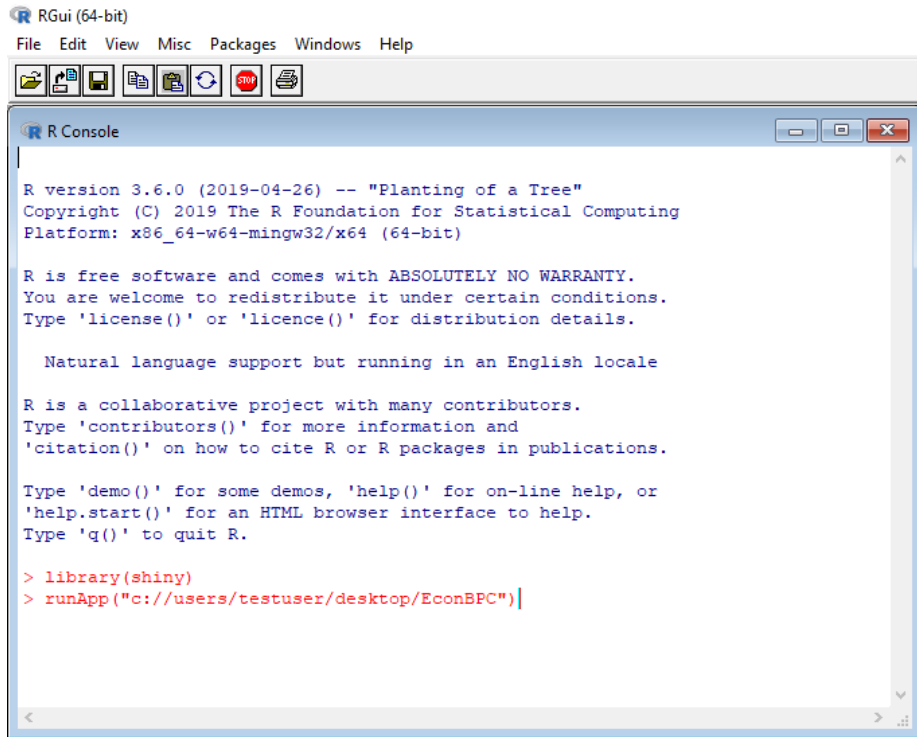
```
> install.packages("shiny")
> library(shiny)
```
6. If you are prompted to select a CRAN mirror, please select a mirror from the list.
7. Start EconBPC with the following command:

```
> runApp(appDir="{enter path of directory containing server.R and ui.R}")
```

Example: Launch of the application via the R console under Windows, assuming the files server.R and ui.R were saved by a user named "testuser" in a directory named "EconBPC" on the desktop of the PC:

```
> install.packages("shiny")
> # select a CRAN mirror from the appearing list, e.g., "Germany (Göttingen)"
> library(shiny)
> runApp(appDir="c://users/testuser/desktop/EconBPC")
```

After executing the commands in the R console, the web application EconBPC is automatically launched in the standard browser of the system.



```

RGui (64-bit)
File Edit View Misc Packages Windows Help

R Console

R version 3.6.0 (2019-04-26) -- "Planting of a Tree"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> library(shiny)
> runApp("c://users/testuser/desktop/EconBPC")

```

Fig. 2. Commands for launching EconBPC via the R console

## 4 Launching EconBPC via RStudio

Before running EconBPC via RStudio (see Fig. 3), the following steps must be performed:

1. Install the latest version of R and RStudio on your PC.
2. Download EconBPC.zip from the link provided above.
3. Extract the files server.R and ui.R from the zip file and save them in a directory.
4. Start RStudio.
5. Install and load the “Shiny” library using the following commands in the RStudio console:
 

```

> install.packages("shiny")
> library(shiny)

```
6. If you are prompted to select a CRAN mirror, please select a mirror from the list.
7. Open the files server.R and ui.R in RStudio.

8. Press the button "Run App" in the user interface of RStudio (see Fig. 3).

9. Press the button "Open in Browser" in the opening window of RStudio's Viewer.

*Note: EconBPC has to be opened in the web browser with some versions of RStudio, as RStudio's viewer is in some cases unable to display the elements of the user interface correctly by default. When testing the EconBPC application with RStudio version 1.1.46, the visualization in the viewer did not work correctly. In this case, the application must be opened in the web browser (tested with Google Chrome version 105.0.5195.102). In the RStudio version 2022.07.1 (Build 554) the viewer was able to display the application correctly during testing. However, to avoid malfunctions, I generally recommend running the application using a web browser.*

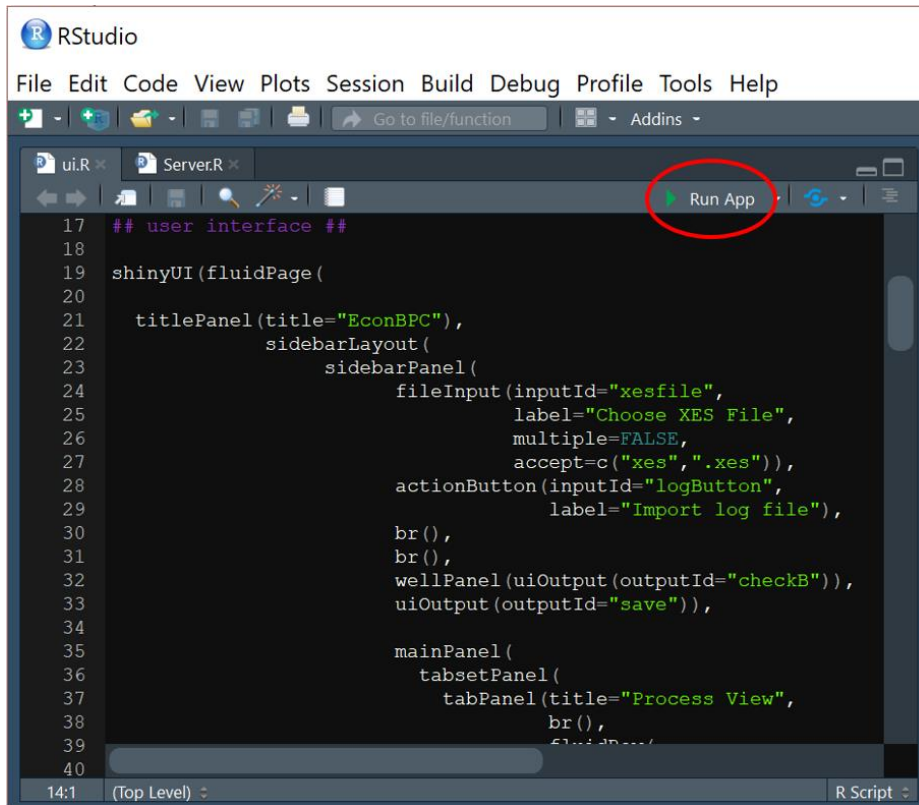


Fig. 3. Screenshot of RStudio highlighting the "Run App" button

## 5 Brief Instruction Manual

In order to use EconBPC for the economic assessment and analysis of Business Process Compliance, follow these four steps:

1. Click the "Browse" button to select a log file in XES format from your local system. To import the log file, click the "Import log file" button. After the import, the log file is displayed as a table in the tab named "Log". Based on the log file, the underlying business process is reconstructed and visualized as a multigraph in the tab called "Process View". Selecting the checkbox "Animate process map" starts an animated token replay.
2. If your log file does not contain information about compliance events, you can use the selection box named "Specify compliance activity" to define the process activities that serve to meet requirements. To do so, click the appropriate checkboxes. Subsequently, the compliance process is visualized as a multigraph in the tab called "Compliance View & Economic View". Selecting the checkbox "Animate process map" starts an animated token replay. Below the visual representation, a table shows the Compliance Process Patterns and their absolute and relative frequency of occurrence.
3. Specify cost and reliability data for compliance events in the tab called "Data Input". If your log file already contains cost and/or reliability data, you can assign appropriate attributes. To do so, select the corresponding attributes of the log file from the dropdown menus. If the log file does not contain any cost and/or reliability data, these can be added specifically for each compliance activity. Press the button "Save data" to save your entries. After saving, the costs and reliabilities of all Compliance Process Patterns are automatically calculated and added to the table in the tab "Compliance View & Economic View". In this tab you can also annotate cost and reliability data as well as event frequencies on the multigraph. To do so, place the radio button in front of the attribute to be annotated.
4. Specify the underlying compliance requirement in the tab called "Compliance Requirement". Name the requirement and, if possible, specify the infringement costs that could result from a potential compliance violation. Press the button "Save data" to save your entries. If infringement costs were specified, both gross and net economic benefits of the compliance process are calculated and added to the table in the tab "Compliance View & Economic View".

## 6 Involved Packages/Libraries

EconBPC makes use of several R packages that go beyond the basic R library. The required packages are automatically loaded and installed when the application is started for the first time, unless they are already included in your user library. The following list shows the packages used in EconBPC:

- shiny 1.7.2 [3]
- shinycssloaders 1.0.0 [4]
- bupaR 0.5.0 [5]

- edeaR 0.9.0 [6]
- eventdataR 0.3.1 [7]
- processmapR 0.5.1 [8]
- processmonitR 0.1.0 [9]
- processanimateR 1.0.5 [10]
- xesreadR 0.2.3 [11]
- data.table 1.14.2 [12]
- DT 0.24 [13]
- plyR [14]
- dplyR 1.0.9 [15]

## 7 Disclaimer of Warranty

To the extent permitted by law, I do not provide any warranty for the program EconBPC. Unless otherwise confirmed in writing, the copyright holders and/or third parties make the program EconBPC available "as is", that is, without any warranty. The full risk regarding the quality and performance of the program EconBPC belongs to the user.

## References

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## **Update History**

- **September 13, 2022**
- June 26, 2022
- March 24, 2020
- November 6, 2019
- April 28, 2019