## **Instructions**

**Note:** The Icelandic instructions await being translated into English.

The software consists of four primary tabs:

1. **Source votes and seats:** This tab is used to upload or enter names of constituencies (electoral districts), number of fixed seats and adjustment seats in each constituency, names of parties standing for election, and votes of each party in each constituency. The votes may be real or prepared, and for simulation they are used as expected values. Currently the software does not allow for a variable total number of seats in a constituency. The tab also offers the possibility of saving and uploading votes, electoral systems, and simulation settings together to or from a single file ("Save all" and "Upload all").
2. **Electoral systems:** Here details of systems to be analyzed may be entered or uploaded. The basic assumption is proportional representation in several constituencies, each one being represented by multiple members, but single member constituencies are also allowed for. It is assumed that each party stands for election in all (or most of) the constituencies, by presenting a list of candidates in each one. The selection of parliament members is assumed to be carried out in three stages:
   1. **Allocation of fixed seats:** During this stage a selected allocation rule (such as D'Hondt or Sainte-Laguë) perhaps including a minimum percentage (threshold) of votes in the constituency needed to obtain a seat.
   2. **Apportionment of adjustment seats to parties:** The first stage may result in uneven distribution of seats among the parties, i.e. not proportional to their total votes, and the adjustment seats exist to rectify this[[1]](#footnote-1). Thus in stage b the total number of seats which each party should receive countrywide is computed according to its total vote. This computation uses a proportional allocation rule, which may be selected differently to the one used in stage a. A party's adjustment seats are simply the difference between this total and its total number of fixed seats. The tab allows setting a threshold on the vote percentage and/or the number of seats a party must obtain nationally to be elligible for adjustment seats.
   3. **Allocation of adjustment seats to lists:** Stages a and b have decided how many candidates each party gets, but not who should be elected. The purpose of stage c is to determine how many candidates to select from each presented list. This process is somewhat more complex than the earlier stages and now several alternatives exist. Some of the allocation methods are based on existing law in different countries, some have been proposed in the political science literature, and some are proposals of the software authors. Most of the methods incorporate an allocation rule and this is specified separately.
3. The number of seats allocated to each list

*Electoral system*

Secondly, one or more electoral systemmust be designed by the user. The basic rules, like D‘Hondt, largest remainders etc., must be selected. The user mustalso choose between a dozen of different methods to allocate adjustment seats.

*Single election*

In this output the results are calculated on the basis of the choosen votes and seats data for each electoral system seperately. Along with a table with apportioned seats the allocation of the adjustment seats are shown in detail. Thirdly, there is a number of quality indicators for each of the user defined election system. See also the following.

*Simulated elections*

This function allows the user to generate hundreds or even thousands of election results based on the specified table of votes as expected values. The user can specify a coefficient of variation for the distribution of the vote values. These are generated independently for each party list in each constituency using one of three distribution functions.

On the basis of these simulated results averages of the seat allocations are reported together with standard errors and some other statistical indicators. Furthermore diverse quality measures. Some of these require comparing the seat allocations to *Reference seat shares*, where the allocations are calculated exactly in real numbers, not as integer values of seats. For that purpose, the votes are scaled such that the shares sum up to the proper total number of seats, optionally for each constituency or each party or both (using the specified number of seats for constituencies, and the required total number of seats for each party, as determined by the chosen rule for dividing adjustment seats). By default, both constraints are applied which corresponds to the optimal biproportional seat allocation.

The results of the simulation are displayed as it goes on. The final results can also be download as an Excel file including further details.

This software is free to use for experimental purposes, available from [Github](https://github.com/smari/voting/). If used for commercial or political reasons, please contact the supervisor to discuss supporting the project financially.

1. Among the reasons for such unproportionality are: (i) each list's seats are integers, rounded from the corresponding vote share, and some parties may be lucky in receiving a lot of rounding-ups (ii) the allocation rule used in stage a may be biased, and this bias will accumulate when all the constituency results are combined, and (iii) the value of votes (voters per seat) may differ among the constituencies and so may the support of the parties. [↑](#footnote-ref-1)