There are ‘kmax’ (default 3) insurers, one of which is the player.

Each insurer has a set of risk preferences, ranked from the five available risk preferences (see module ‘preferences’).

The computer simulation works on a round system, with each insurer offering premiums until that insurer agrees a premium with a ship.

The base premium for all insurers is ‘premium\_fract’ which is the fraction of the Ship Value which is charged each year. However, the premium offered will increase according to the risk preferences. ( typically 0.1 for highest preference, 0.11 for second highest preference etc. The base premium is fixed throughout the bidding system.

A second adjustment to the premium offered is based on the remaining funds in the insurance book. ‘Prem-inc’ increases according to the remaining unds, representing the increasing confidence which the insurer has in selling out his book. ‘Pre\_inc’ varies proportionately between 0 for the full book, 0.5 for half the full book and 0.9 for the last remaining funds in the book.

The underwriters in the coffee house offer their best premiums ( highest in risk preference).

This is round 1 when up to kmax (3) ships will be offered preferential premiums. Offers are made by each insurer e.g Algo1 goes first , Algo 2 goes second , MyAlgo goes third. However, as each ship is insured the remaining premiums offered are adjsted according to ‘prem\_inc’.

This module calls extensively on a subroutine ‘draw\_grid\_tjh’ in which nested lists are blitted’ see subroutines pseudocode

It can be that the first choice of, say insurer 0, has a higher premium than the same ship in one of the other insurers.

In this case the bidding remains with insurer 0, but moves on to his second highest choice etc..

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| --- | --- | --- | --- | --- | --- | --- |
| tab 0 | tab 1 | tab 2 |  |  |  |  |
| def premiums\_alt\_sub which is for the educational part only (takes window and canvas) | | | | | | |
| 10 | define smax , the maximum number of ships for the educational part (default 10) | | | | | |
|  | put smax in the local\_data mirror | | | | | |
|  | retrieve mmax from the local\_data mirror (default 3) | | | | | |
|  | set ‘from\_index’ as 0 indicating that premiums\_alt is being run from the educational section | | | | | |
|  | create ship\_list\_me as random sample of ship\_data (as numbers in the ship\_data list | | | | | |
|  | put ship\_list\_me in local\_data mirror | | | | | |
|  | create blank lists for ship\_list\_selected and insurers list | | | | | |
|  | instantiate Ships using the numbers in ship\_list\_me. The stips are stored in ship\_list\_selected and a local data mirror is created | | | | | |
|  | the Insurers are instantiated, and a mirror created in local\_data | | | | | |
|  | the programme is then passed to premiums\_alt\_sub\_sub | | | | | |
|  |  |  |  |  |  |  |
| def premiums\_alt\_sub\_sub ( takes window, canvas. ship\_list\_me,ship\_list\_seected, insurers\_list and from\_index -which is set to 1 if coming from goinside menu otherwise 0 from premiums\_alt\_sub | | | | | | |
| 21 | retrieve smax, and mmax | | | | | |
|  | set slength as smax. This is used for adjusting the display table (maybe) | | | | | |
|  | 3 color definitions | | | | | |
|  | 4 font definitions |  |  |  |  |  |
| 43 | 6 initial text comprising headers for tables to follow |  |  |  |  |  |
| 53 | set text and coordinates of menu button | | | | | |
|  | set cell hights and widths |  |  |  |  |  |
| 54 | set text and coordinates of coffee ship menu button | and blit menu and coffee shop buttoms |  |  |  |  |
|  | There follows the creation of five tables:  1 At the top is the ships data ( table0)  2 A statement of the initial book values and base premiums for each insurer (table 0a – insurer\_premium\_base\_nested\_list)  3 A table of the initial “premiums offered” – this changes dynamically as each insurer takes a turn to select a ship (table 1) -  4. A Table of “premiums accepted” which changes dynamically as each ship and insurer agree on a premium (table 2b)  5. The remaining book value of each insurer (table 3) | | | | | |
| 69 | CREATE BLANK NESTED LIST FOR TABLE 0a – initial book values and premiums | | | | | |
|  | two rows and three colums per insurer (insurer name, initial book value, premium percentage | | | | | | |
|  | creates blank entries in insurer\_premium\_base\_nested\_list | | | | | | |
| 79 | CREATE BLANK NESTED LIST FOR TABLE 0a – initial book values and premiums | | | | | | |
|  | two rows and three colums per insurer (insurer name, initial book value, premium percentage | | | | | | |
|  | creates blank entries in insurer\_premium\_base\_nested\_list | | | | | | |
|  |  | | | | | | |
| 80 | ### BLANK PREMIUMS OFFERED LIST TABLE 1 | | | | | | |
|  | create blank list | | | | | | |
|  | cols\_insurer=4 |  | | | | | |
|  | for I in range 0,imax+2 | for this nested list there are 4 columns for each insurer (ship, risk factor, book factor and premium offered | | | | | |
|  |  | allows for two rows of headers in blitted nested list | | | | | |
|  |  | create empty ‘row’ list | | | | | |
|  |  | for j in range -,cols\_insurer\*kmax | | | | | |
|  |  |  | create dummy entry ( e.g. row number and column number) | | | |
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|  | ### BLANK PREMIUMS ACCEPTED LIST – TABLE 2B | | | | | | |
| Tab 0 | Tab 1 | Tab 2 | Tab 3 | Tab 4 | Tab 5 |  |
| 89 | cols\_insurer=2 | for this nested list there are 2 columns for each insurer and premium accepted | | | | | |
|  | for I in range 0,imax+2 | allows for two rows of headers in blitted nested list | | | | | |
|  |  | create empty ‘row’ list |  |  |  |  |
|  |  | for j in range -,cols\_insurer\*kmax | | | | | |
|  |  |  | create dummy entry ( e.g. row number and column number) | | | |
|  |  |  | append to premiums\_accepted\_list | | | |
| 100 | ### BLANK REMAINING BOOK VALUE LIST – TABLE 3 | | | | | | |
|  | create blank list | | | | | |
|  | cols\_insurer=2 | for this nested list there are 2 columns for each insurer and premium accepted | | | | | |
|  | for I in range 0,2 | allows for ONE rows of headers in blitted nested list | | | | | |
|  |  | create empty ‘row’ list | | | | | |
|  |  | for j in range -,cols\_insurer\*kmax | | | | | |
|  |  |  | create dummy entry ( e.g. row number and column number) | | | |
|  |  |  | append to insurer\_book\_value\_nested\_list | | | |
| 109 | position data for tables |  |  |  |  |  |

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|  | ### CREATE TABLES | | | | | |
| 109 | set table start coordinates and rects for titles | | | | | | |
| 130 | create two lists of ships one with titles and one without – each containing most ship data | | | | | | |
| 165 | display as table 0 using subroutine draw\_grid\_tjh | | | | | | |
| 168 | create table0a on initial book value and premium percentage and display using subroutine draw\_grid\_tjh | | | | | | |
|  | Tab 1 | Tab 2 | Tab 3 | Tab 4 | Tab 5 | Tab 6 |
|  | ### CREATE BLANK TABLE 1 LIST OF SHIPS IN PREFERENCE ORDER FOR EACH INSURER | | | | | | |
| 188 | for m in mmax: | for each insurer |  |  |  |  |
|  |  | creates blank premiums\_offered\_nested list | | | | | |
|  |  | displays using subroutine draw\_grid\_tjh | | | | | |
|  | ### CREATE BLANK TABLE 2b FOR PREMIUMS ACCEPTED | | | | | |
| 201 | for m in mmax: | for each insurer |  | | | |
|  |  | creates blank premiums\_accepted\_nested-list | | | | |
|  |  | display using subroutine draw\_grid\_tjh | | | | |
|  | ### CREATE RESIDUAL BOOK VALUE TABLE 3 | | | | | |
| 221 | for m in mmax |  |  | | | |
|  |  | create nested list of insurer and book value | | | | |
|  |  | display using subroutine draw\_grid\_tjh | | | | |
|  | update display |  |  | | | |
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| 238 | ### CREATE LISTS OF SHIPS IN PREFERENCE ORDER | | | | | |
|  | Tab 1 | Tab 2 | Tab 3 | Tab 4 | Tab 5 | Tab 6 |
|  | for m in range mmax |  |  | | | |
|  |  | creates blank preference\_list, ship\_sorted\_list | clears the list for each insurer | | | |
| 243 |  |  | if m==2 | tests to see if insurer My Algo using the length of inspref\_list in local data. If underwriter\_preferences has not been run then inspref list is unpopulated | | |
|  |  |  |  | if inspref\_list>1 | tests to see if inspref list exists from underwriter preferences | |
|  |  |  |  |  | retrieves My Algo preferences c1-c5 from inspref list | |
|  |  |  |  | else |  |  |
|  |  |  |  |  | retrieves My Algo Preferences from local data default | |
|  |  |  | else | not My Algo |  |  |
|  |  |  |  | retrieves risk preferences from local data as clist | | |
|  | (for m in mmax loop) |  |  |  | retrieves risk priorities c1-c5 from local\_data | |

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| ### CREATE LISTS SORTED BY INSURER RISK PREFERENCES | | | | | |
| Tab 2 | Tab 3 | Tab 4 | Tab 5 | Tab 6 |  |
| ship\_sorted\_list = sorted (ship\_list\_nested) | for s in smax creates new ship\_sorted\_list from ship\_list\_nested sorted by 5 risk preference criteria for current insurer m and appends it to the insureres\_preference\_lst | | | | |
|  | | | | | |
| 265 | for s in smax | ship\_name=ship\_sorted\_list [s][0] | retrieves ship name from ship\_sorted\_list | | |
| 267 |  | premiums\_offered\_nested\_list [s+2][m\*4] = ship\_name | stores ship name at appropriate place under insurer m | | |
|  |  | premium annual is retreved from insureres\_list m (Note this is a % which can be adjusted in underwriter preferences: | | | |
|  |  | if m==2 , if local\_data,myalgo\_premium exists set my algo premium from myalgo\_premium |  | | |
|  |  | risk\_factor=1+s\*0.1 | calculates risk factor | | |
|  |  | premiums\_offered\_nested\_list[s+2][m\*4+1]= risk factor | stores risk factor | | |
|  |  | book\_factor=insurers\_list[m].book\_value  /insurer\_base\_book\_value | calculates book factor using book value as fraction of bse book value | | |
|  |  | premiums\_offered\_nested\_list[s+2][m\*4+2] | stores book factor | | |
|  |  | premium\_offer = ship\_value\*risk\_factor\*book\_factor | calculates premium\_offer | | |
|  |  | premiums\_offered\_nested\_list[s+2][m\*4+3] | stores premium offered | | |
| 287 |  | subroutine.raw\_grd\_tjh | draw grid |  |  |
| tab 2 |  |  |  |  |  |
| window blit and update (325) |  |  |  |  |  |

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| Tab 1 | Tab 2 | Tab 3 | Tab 4 | Tab 5 |  |
| ### BIDDING ROUNDS ### | | | | | |
| 295 | s=0, m=-1, round\_count=0 | to pick up just first line of premiums\_offered\_nested list |  |  |  |
| end\_of\_bidding=False |  |  |  |  |  |
| while end\_of\_bidding =False loop | | | | | |
| 295 | m=m+1 | increments with each rund |  |  |  |
|  | round\_max=int(smax/mmax) | calculates max number of rounds |  |  |  |
|  | round\_count=0 | initialise round\_count |  |  |  |
|  | accepted\_total=0 | used to determine if acceoted |  |  |  |
| 301 | insurer\_not\_list=[] | to create a new list with each m | simply the two insurers which are not the current m |  |  |
| 305 | accepted=0 |  |  |  |  |
| 306 | while accepted !=2 or s<=smax | will continue in this loop for insurer m until either accepted=2 for that round of bidding or all ships are bid | | | |
|  |  | takes top ship name from premiums\_offered\_nested\_list, together with the premium offered, or highest ship name if the previous bid is rejected | | | |
|  |  | draw premiums\_offered\_nested\_list (table 1)using draw\_grid\_wiht -name | | | |
|  |  | update display of table 1 at the start |  |  |  |
|  |  | zeros srep\_list and tries | | | |

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| tab 3 | tab 4 | tab 5 | tab 6 | tab 7 | tab 8 |
| while accepted!=2 or s<=smax |  |  |  |  |  |
| CHECK THAT THE OTHER INSURERS HAVE NOT SUBMITTED A LOWER OFFER | | | | | |
| for mothernumb in len (insurer not list) | | | | | |
|  | mother = number in insurer not list | not current user m. Take two in turn |  |  |  |
| 322 | for sdown in len(premiums\_offered\_nested\_list -2) 2 are subtracted for headers | | | | |
|  |  | identifes ship\_name\_other from the premiums\_offered\_nested list at posiiton sdown | | | |
| 325 |  | if ship\_name == ship\_name\_other | finds the ship in list ‘mother’ with the same name as the ship selected from m | | |
|  |  |  | increments ‘tries’ which is number of comparisons of ship\_name with ship\_name\_other ( two expected) | | |
|  |  |  | sets premium\_offered\_other by retrieving from premium\_offered\_nested\_list at position sdown | | |
| 328 |  |  | **if premium\_offered<=premium\_offered\_other** | | |
|  |  |  |  | accepted +=1 |  |
|  |  |  |  | srepl\_list.append(sdown) | keeps position in list of preferences for other insurer mother |
|  |  |  |  | saccept=s | keeps position in insurer m |
| 335 |  |  | continue | breaks look once an acceptance has been found | |

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| tab 3 | tab 4 | tab 5 | tab 6 | tab 7 | tab 8 |
| while accepted!=2 or s<=smax | sdown loop complete |  |  |  |  |
|  | ## ON REACHING THIS POINT BOTH OTHER INSURERS WILL HAVE BEEN EVALUATED | | | | |
| 342 | if accepted<=2 | another insurer has a better premium | | | |
|  |  | if tries>=2 | not sure if this is necessary | | |
|  |  |  | fail\_round is set as True | no ship has been insured this round | |
|  |  |  | accepted=0 |  |  |
|  | **else:** | meaning accepted ==2 | | | |
|  |  | fail\_round s set to true | | | |
|  |  | accepted is reset to 0 |  |  |  |
|  |  | accepted total is incremented | | | |
|  |  | ship\_name and premium offered is inserted in accepted\_listed\_list based on round\_count and m | | | |
|  |  | remaining book value of insurer m is updated insurers list | | | |
|  |  | insurers [m] list of ships insured is updated | | | |
|  |  | ### UPDATE INSURED DATA IN SHIP LIST SELECTED | | | |
|  |  | for sfind in range ship\_list\_selected | | | |
|  |  |  | if ship\_name = ship\_name in ship\_list\_selected | | |
| 355 |  |  |  | in ship\_insurer store insurer name and premium offered | |
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| tab 3 | tab 4 | tab 5 | tab 6 | tab 7 | tab 8 |
|  | MOVE LIST ONE UP IN OFFERED LIST TO FILL PLACE OF THAT ACCEPTED | | | | |
| (while accepted!=2 or s<=smax) | (in accepted==2) |  |  |  |  |
| 357 |  |  |  | | |
|  |  |  |  | | |
| tab 5 | tab 6 | tab 7 | tab 8 | tab 9 |  |
| for srepl in range saccept to smax-1 | saccept allows for the accepted ship to be lower down the preference list | | | | |
|  | ship\_name\_below is retrieved from offered list | | | | |
|  | if ship\_name\_below is not blank “” |  |  | | |
|  |  | for sv in range smax |  |  | |
|  |  |  | retrieve ship data from ship\_sorted\_list | | |
|  |  |  | retrieve first ship\_name in sv of ship\_sorted-list (ship\_name\_search | | |
| 362 |  |  | if ship\_name\_below==ship\_name\_search | | |
|  |  |  |  | load ship\_value\_below from ship\_sorted\_list | |
|  |  |  |  | calculate new book factor as proporting of initial value ovver remaining value | |
|  |  |  |  | cap book factor at 3 |  |
|  |  |  |  | load risk-factor from premiums\_offered\_nested\_list | |
|  |  |  |  | calculate revised premium for ship below | |
|  | else (blank) | set book facltor , name, and risk factr to 0 | not sure this is necessary |  |  |
|  | load book factor, risk factor, premium beow into premiums\_offered\_nested\_list at srepl+2 | | | | |
| load zero book\_facotr\_etc at smax+1 | | | | | |
|  |  |  |  |  |  |
| tab 5 | tab 6 | tab 7 | tab 8 | tab 9 |  |
| REMOVE FROM LIST OF UNSUCCESSFUL INSURERS | | | | | |
| for mnotnum in insurer\_not\_list | | | | | |
|  | retrieve mnot | actual number of insurer |  |  |  |
|  | sfromrepl=srepl\_list[mnotnumb] |  |  |  |  |
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| Tab 4 | Tab 5 | Tab 6 | Tab 7 | Tab 8 |  |
| (if len(ship\_name)>2) |  |  |  |  |  |
|  | retrieve premium offered at [k+2][m\*4+3] for that ship and insurer | | | | |
|  | ######### CHECK THAT OTHER INSURERS HAVE NOT MADE A BETTER OFFER | | | | |
|  | insurer\_not\_list=[] | initialise list of insurers other than the current insurer who has made an offer | | | |
|  | accepted\_not\_list=[] | initialis this list of ship locations in the insurers preferance list which has the same name as the insurer leading the bidding | | | |
|  | for mx I n range (0,mmax)  if mx!=m: insurer\_not\_list\_append (mx | creates list of other insurers ie not the insurer leading the bidding | | | |
|  | zmxx=0 | initialises a counter which will retrieve the insurer from insurer\_not\_list | | | |
|  | while zmxx<len(insurer\_not\_list) |  |  |  |  |
|  |  | mxx=insurer\_not\_list[zmxx] | retrieves each other insurer in turn | | |
|  |  | for sxxx in range (0,smax): |  | | | |
|  |  |  | ships\_name\_other= premiums\_offered\_nested\_list  [sxxx+2][mxx\*4]  retrieves ship name inturn | | |
|  |  |  | premium\_offered\_other retrieved similarly | | |
|  |  |  | if ship\_name==ship\_name\_other | finds location of ship with same name that of the top preference of the lead insurer | |
|  |  |  |  | if premium\_offered<= premium\_offered\_other |  |

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| Tab 8 | Tab 9 | Tab 10 | Tab 11 |  |  |
| ### PREMIUM ACCEPTED ### | | | | | |
| if premium\_offered<= premium\_offered\_other |  |  |  |  |  |
|  | accepted\_not\_list.append(sxxx) | stores the number of the ship accepted | | | |
|  | premiums\_accepted\_nested\_list[s + 2][m \* 2] = ship\_name | stores the ship name accepted | | | |
|  | premiums\_accepted\_nested\_list[s + 2][m \* 2 + 1] = premium\_offered | stores the premium accepted | | | |
|  | ### MOVE LIST ONE UP IN OFFERED LIST TO FILL SPACE OF ACCEPTED | | | | |
|  | for srepl in range (0,smax-1): | starting from the top of the insurers list, keeping in mind that one ship moves form this list to the accepted list | | | |
|  |  | premiums\_offered\_nested\_list[srepl + 2][m \* 4 + 3] = premiums\_offered\_nested\_list[srepl + 2+1][m \* 4 + 3] | replace with premium from below | | |
|  |  | premiums\_offered\_nested\_list[srepl + 2][m \* 4] = premiums\_offered\_nested\_list[srepl + 2+1][m \* 4] | replace with sship name from below | | |
|  | premiums\_offered\_nested\_list[srepl+2+1][m \* 4 + 3] = 0 | create a zero for last premium as blank |  |  |  |
|  | premiums\_offered\_nested\_list[srepl+2+1][m \* 4]="srepla "+str(srepl)+" m "+str(m) | create a blank line for last entry – for troubleshooting assinged an identifier | | | |
| Tab 5 |  |  |  |  |  |
| zmxx+=1 | increment insurer\_not\_list index |  |  |  |  |
| Tab 4 |  |  |  |  |  |
| Blit updated tables |  |  |  |  |  |

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| ### REMOVE ACCEPTED SHIP FROM PREFERRED LISTS OF OTHER INSURERS | | | | | |
| Tab 5 | Tab 6 | Tab 7 | Tab 8 |  |  |
| for zmxnot in range(0,len(insurer\_not\_list)): | zmxnot is a counter for the two item list “insurer\_not\_list” | | | | |
|  | mxx = insurer\_not\_list[zmxnot] | retrieves the insurer from the not\_list | | | |
|  | sxxl=accepted\_not\_list[zmxnot] | retrieves the position of the ship in the not\_insurers preference list | | | |
|  | for srepl in range (sxxl,smax-1): | counter for replacement, starting at sxxl and leaving last line void | | | |
|  |  | premiums\_offered\_nested\_list[srepl + 2][mxx \* 4 + 3] = premiums\_offered\_nested\_list[srepl + 2+1][mxx \* 4 + 3] | replaces premium | | |
|  |  | premiums\_offered\_nested\_list[srepl + 2][mxx \* 4] = premiums\_offered\_nested\_list[srepl + 2+1][mxx \* 4] | replaces name | | |
|  |  | premiums\_offered\_nested\_list[srepl+2+1][mxx \* 4 + 3] = 0 | voids last line | | |
|  |  | premiums\_offered\_nested\_list[srepl+2+1][mxx \* 4] = "sreplnot "+str(srepl)+" mxx "+str(mxx) | voids last line | | |
| blits tables |  |  |  |  |  |
| Tab 4 |  |  |  |  |  |
| m+=1 | moves to next insurer |  |  |  |  |