

Appendix B

Validation - Betting Parameters

These test cases can be found and run in the validation module of the project.

The results are based two AI agents playing against each other, with 20,000 hands played, per test case.

Process used to determine optimal values for parameters:

- Define a default range of values for the betting parameters.
- For each parameter, test against different value for that particular parameters and obtain value which seems to be performing the best.
- Create a new set of values for the parameters from these proposed values and test against previous default parameters.

The following series of tests are the tests ran and documented to produce the set of parameters that are used within the project.

The test classes can be found in the com.saccarn.poker.tests package in the validation module of the project. The values can be found in com.saccarn.poker.betpassvalues package of the same module.

The recorded results include the winning player, defined in the test case, the winning margin in terms of big blinds, and the variance of this margin.

Test against random distribution of parameters to determine default set of parameters

| Test Case | Test Class (to run) | Values | Result |
|--|-----------------------------|----------------------------------|---|
| Default Values (Player One) vs BetPassValuesTest1 (Player Two) | TestDefaultVsBetPassValues1 | DefaultValues BetPassValuesTest1 | Player One won: 1.372 big blinds per hand +- 0.2354 |
| Default Values (Player One) vs BetPassValuesTest2 (Player 2) | TestDefaultVsBetPassValues2 | DefaultValues BetPassValuesTest2 | Player One won: 1.4839 big blinds per hand +- 0.37847 |

Conclusion: Default Values seem good enough to try and improve on.

Psass parameter

| Test Case | Test Class (to run) | Values | Result |
|---|-----------------------------|----------------------------------|--|
| Default Values (Player One) vs BetPassValuesTest3 | TestDefaultVsBetPassValues3 | DefaultValues BetPassValuesTest3 | Player One won: 0.14175 big blinds per hand +- 0.21417 |

| | | | |
|--|-----------------------------|----------------------------------|--|
| (Player 2) | | | |
| Default Values (Player One) vs BetPassValuesTest4 (Player 2) | TestDefaultVsBetPassValues4 | DefaultValues BetPassValuesTest4 | Player One won: 0.07745 big blinds per hand +- 9.14908 |

Conclusion: Default Pass Parameter seems to produce optimal results compared to other values

Bet2 parameter

| Test Case | Test Class (to run) | Values | Result |
|--|------------------------------------|---------------------------------------|--|
| Default Values (Player One) vs BetPassValuesTest5 (Player 2) | TestDefaultVsBetPassValues5 | DefaultValues BetPassValuesTest5 | Player Two won: 0.018 big blinds per hand +- 0.1268 Player One won : 0.3248 |
| Default Values (Player One) vs BetPassValuesTest6 (Player 2) | TestDefaultVsBetPassValues6 | DefaultValues BetPassValuesTest6 | Player Two won: 0.1768 big blinds per hand Player One won: 0.482 +- 0.08276 |
| BetPassValuesTest5 (Player One) vs BetPassValuesTest6 (Player Two) | TestBetPassValues5VsBetPassValues6 | BetPassValues5 BetPassValues6 | Player One won 0.2526 big blinds per hand +- 0.191511. |
| BetPassValuesTest5 (Player One) vs BetPassValuesTest7 (Player Two) | TestBetPassValues5VsBetPassValues7 | BetPassValues5 BetPassValues7 | Player One won: 0.344435 big blinds per hand +- 0.29577 |
| BetPassValuesTest6 (Player One) vs BetPassValuesTest7 (Player Two) | TestBetPassValues6VsBetPassValues7 | BetPassValues6 BetPassValues7 | Player Two won: 0.001 big blinds per hand +- 0.2146 |
| BetPassValuesTest5 (Player One) vs BetPassValuesTest8 (Player Two) | TestBetPassValues5VsBetPassValues8 | BetPassValuesTest5 BetPassValuesTest8 | Player Two won: 0.0095 big blinds per hand. 0.3748 +- 0.2327 (Player one) |
| BetPassValuesTest8 (Player One) vs BetPassValuesTest9 | TestBetPassValues8VsBetPassValues9 | BetPassValuesTest8 BetPassValuesTest9 | Player One won: 0.19065 big blinds per hand +- 0.2878 |

| | | | |
|---|-------------------------------------|-----------------------------------|--|
| (Player Two) | | | |
| BetPassValuesTest8 (Player One) vs BetPassValuesTest10 (Player Two) | TestBetPassValues8VsBetPassValues10 | BetPassValues8 BetPassValues10 | Player One won: 0.2283 big blinds per hand. 0.058 +- 0.1753 |

Conclusion: Bet2 Parameter of BetPassValuesTest8 seems to produce optimal results

Bet3 Parameter

| Test Case | Test Class (to run) | Values | Result |
|--|------------------------------|----------------------------------|---|
| DefaultValues (Player One) vs BetPassValuesTest11 (Player Two) | TestDefaultVsBetPassValues11 | DefaultValues BetPassValues11 | Player One won: 0.3951 big blinds per hand +- 0.1649. |
| DefaultValues (Player One) vs BetPassValuesTest12 (Player Two) | TestDefaultVsBetPassValues12 | DefaultValues BetPassValues12 | Player One won: 0.0575 big blinds per hand +- 0.20893. |
| DefaultValues (Player One) vs BetPassValuesTest13 (Player Two) | TestDefaultVsBetPassValues13 | DefaultValues BetPassValues13 | Player One won: 0.0946 big blinds per hand +- 0.1465. |

Conclusion: Default Pass Parameter seems to produce optimal results compared to other values.

All In Parameter

| Test Case | Test Class (to run) | Values | Result |
|--|------------------------------|--------------------------------------|---|
| DefaultValues (Player One) vs BetPassValuesTest14 | TestDefaultVsBetPassValues14 | DefaultValues BetPassValuesTest14 | Player One won: 0.015173 big blinds per hand +- 0.14198. |
| DefaultValues (Player One) vs BetPassValuesTest15 (Player Two) | TestDefaultVsBetPassValues15 | DefaultValues BetPassValuesTest15 | Player One won: 0.1109 big blinds per hand +- 0.157876. |
| DefaultValues (Player One) vs | TestDefaultVsBetPassValues16 | DefaultValues BetPassValuesTest16 | Player Two won: 0.07265 big blinds per |

| | | | |
|---|---|--|--|
| BetPassValuesTest16 (PlayerTwo) | | | hand +- 0.08768 |
| BetPassValuesTest15 (Player One) vs BetPassValuesTest16 (Player Two) | TesDefaultVstBetPassV alues15VsBetPassValue s16 | BetPassValuesTest15 BetPassValuesTest16 | Player Two won: 0.223845 big blinds per hand +- 0.12841. |
| BetPassValuesTest14 (Player One) vs BetPassValuesTest16 (Player Two) | TestBetPassValues14Vs BetPassValues16 | BetPassValuesTest14 BetPassValuesTest16 | Player Two won: 0.202245 big blinds per hand. +- 0.0736 |

Conclusion: All in Parameter in BetPassValuesTest16 seems to produce optimal results compared to other values

Obtained values integrated together:

| Test Case | Test Class (to run) | Values | Result |
|---|--|--|---|
| DefaultValues (Player One) Vs ProposedDefaultValues 1 (Player Two) | TestDefaultValuesVsPr oposedDefaultValues | DefaultValues ProposedDefaultValues | Player Two won: 0.1066 big blinds per hand +- 0.1895. |

Conclusion: New Proposed values beats the previous default values and should be used in the project.

Appendix C

Validation - Testing Common Hand influencing belief vs. Common Hand Not influencing belief

These test cases can be found and run in the validation module of the project.

The results are based two AI agents playing against each other, with 20,000 hands played, per test case.

The test classes can be found in the com.saccarn.poker.tests package in the validation module of the project. The values can be found in com.saccarn.poker.betpassvalues package of the same module. The recorded results include the winning player, defined in the test case, the winning margin in terms of big blinds, and the variance of this margin.

| Test Case | Test Class (to run) | Values | Result |
|---|---|--|---|
| Using CommonHand class influence (Player 1) vs NO CommonHand class influence (Player 2) | TestCommonHandTrue VsCommonHandFalse | CommonHandValues.COMMON_HAND_TRUE, CommonHandValues.COMMON_HAND_FALSE | Player Two won: 0.2657 big blinds per hand +- 0.104236 |

Validation - Testing Hand Potential influencing belief vs. Hand Potential Not influencing belief

These test cases can be found and run in the validation module of the project.

The results are based two AI agents playing against each other, with 20,000 hands played, per test case.

Partial Straight/Flush recognition vs no partial Straight/Flush recognition

| Test Case | Test Class (to run) | Values | Result |
|---|---|--|--|
| Using HandPotential class influence (Player 1) vs NO HandPotential class influence (Player 2) | TestHandPotentialTrue VsHandPotentialFalse | HandPotentialValues.HAND_POTENTIAL_TRUE, HandPotentialValues.HAND_POTENTIAL_FALSE | Player One won: 0.28625 big blinds per hand +- 0.161786 |

Appendix D

Opponent Model Evaluation

These test cases can be found and run in the validation module of the project.

The results are based two AI agents playing against each other, with 20,000 hands played, per test case.

The test classes can be found in the com.saccarn.poker.testsopponentmodels package in the validation module of the project. The values can be found in com.saccarn.poker.opponentmodels package of the same module.

The recorded results include the winning player, defined in the test case, the winning margin in terms of big blinds, and the variance of this margin.

| Test Case | Test Class (to run) | Values | Result |
|--|-----------------------------------|--|--|
| Default Opponent Model (Player 1) vs 'Tight' Opponent Model (Player 2) | TestDefaultVsTightOpponentModel | Default Opponent Model Tight Opponent Model | Player 2 won : 0.114848 big blind per hand +- 0.14597. |
| Default Opponent Model (Player 1) vs 'Loose' Opponent Model (Player 2) | TestDefaultVsLooseOpponentModel | Default Opponent Model Loose Opponent Model | Player 1 won : 0.85546 big blinds per hand +- 0.2127229. |
| Default Opponent Model (Player 1) vs 'Unusual' Opponent Model (Player 2) | TestDefaultVsUnusualOpponentModel | Default Opponent Model Unusual Opponent Model | Player 1 won : 0.1326 big blinds per hand +- 0.1019436 |
| Default Opponent Model (Player 1) vs 'Cluster 1' Opponent Model | TestDefaultVsCluster1Model | Default Opponent Model Cluster 1 Opponent Model | Player 1 won : 0.3749 +- 0.16 big blinds per hand |
| Default Opponent Model (Player 1) vs 'Cluster 2' Opponent Model (Player 2) | TestDefaultVsCluster2Model | Default Opponent Model Cluster 2 Opponent Model | Player 1 won : 0.087 big blinds per hand +- 0.1548 |

| | | | |
|--|-----------------------------|---|---|
| Default Opponent Model (Player 1) vs 'Cluster 3' Opponent Model (Player 2) | TestDefaultVsCluster3 Model | Default Opponent Model Cluster 3 Opponent Model | Player 1 won : 0.6269 +- 0.1059 big blinds per hand |
|--|-----------------------------|---|---|

Appendix E

Validation - Preflop values

The test classes can be found in the com.saccarn.poker.testspreflopvalues package in the validation module of the project. The values can be found in com.saccarn.poker.preflopvalues package of the same module.

PreFlop Rank Value Parameter

| Test Case | Test Class (to run) | Values | Result |
|--|---------------------------------|----------------------------------|--|
| Default Preflop Values (Player 1) vs PreFlopValuesTest1 (Player 2) | TestDefaultVsPreFlopValuesTest1 | DefaultValues PreFlopValuesTest1 | Player 1 won : 0.2908 big blind per hand +- 0.1549. |
| Default Preflop Values (Player 1) vs PreFlopValuesTest2 (Player 2) | TestDefaultVsPreFlopValuesTest2 | DefaultValues PreFlopValuesTest2 | Player 1 won : 0.29225 big blinds per hand +- 0.2586. |
| Default Preflop Values (Player 1) vs PreFlopValuesTest3 (Player 2) | TestDefaultVsPreFlopValuesTest3 | DefaultValues PreFlopValuesTest3 | Player 1 won : 0.06945 big blinds per hand +- 0.0898. |
| Default Preflop Values (Player 1) vs PreFlopValuesTest4 (Player 2) | TestDefaultVsPreFlopValuesTest4 | DefaultValues PreFlopValuesTest4 | Player 1 won : 0.1838 big blinds per hand +- 0.07141563. |
| Default Preflop Values (Player 1) vs PreFlopValuesTest5 (Player 2) | TestDefaultVsPreFlopValuesTest5 | DefaultValues PreFlopValuesTest5 | Player 1 won : 0.1838 big blinds per hand +- 0.7141563. |

PreFlop RandomFold Value Parameter

| Test Case | Test Class (to run) | Values | Result |
|---|----------------------------------|--------------------------------------|---|
| Default Preflop Values (Player 1) vs PreFlopValuesTest6 (Player 2) | TestDefaultVsPreFlopValuesTest6 | DefaultValues PreFlopValuesTest6 | Player 1 won : 0.0851 big blinds per hand +- 0.15556. |
| Default Preflop Values (Player 1) vs PreFlopValuesTest7 (Player 2) | TestDefaultVsPreFlopValuesTest7 | DefaultValues PreFlopValuesTest7 | Player 1 won : 0.02899 big blinds per hand +- 0.15367. |
| Default Preflop Values (Player 1) vs PreFlopValuesTest8 (Player 2) | TestDefaultVsPreFlopValuesTest8 | DefaultValues PreFlopValuesTest8 | Player 1 won : 0.16905 big blinds per hand +- 0.248. |
| Default Preflop Values (Player 1) vs PreFlopValuesTest9 (Player 2) | TestDefaultVsPreFlopValuesTest9 | DefaultValues PreFlopValuesTest9 | Player 1 won : 0.13625 big blinds per hand +- 0.10431. |
| Default Preflop Values (Player 1) vs PreFlopValuesTest10 (Player 2) | TestDefaultVsPreFlopValuesTest10 | DefaultValues PreFlopValuesTest10 | Player 1 won : 0.13755 big blinds per hand +- 0.15600. |
| Default Preflop Values (Player 1) vs PreFlopValuesTest11 (Player 2) | TestDefaultVsPreFlopValuesTest11 | DefaultValues PreFlopValuesTest11 | Player 1 won : 0.150755 big blinds per hand +- 0.15942. |