# 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.testbetpassvalues 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.

**Pass parameter**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test Case** | **Test Class (to run)** | **Values** | **Result** |
| Default Values (Player One) vs BetPassValuesTest3 (Player 2) | TestDefaultVsBetPassValues3 | DefaultValues  BetPassValuesTest3 | Player One won: 0.14175 big blinds per hand +- 0.21417 |
| 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 (Player Two) | TestBetPassValues8VsBetPassValues9 | BetPassValuesTest8  BetPassValuesTest9 | Player One won: 0.19065 big blinds per hand +- 0.2878 |
| 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 BetPassValuesTest16 (PlayerTwo) | TestDefaultVsBetPassValues16 | DefaultValues  BetPassValuesTest16 | Player Two won: 0.07265 big blinds per hand +- 0.08768 |
| BetPassValuesTest15 (Player One) vs BetPassValuesTest16 (Player Two) | TesDefaultVstBetPassValues15VsBetPassValues16 | BetPassValuesTest15  BetPassValuesTest16 | Player Two won: 0.223845 big blinds per hand +- 0.12841. |
| BetPassValuesTest14 (Player One) vs BetPassValuesTest16 (Player Two) | TestBetPassValues14VsBetPassValues16 | 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 ProposedDefaultValues1 (Player Two) | TestDefaultValuesVsProposedDefaultValues | 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.testshandpotential and com.saccarn.poker.testscommonhandvalues package in the validation module of the project. The values can be found in com.saccarn.poker.commonhandvalues and com.saccarn.poker.handpotentialstraightvalues 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) | TestCommonHandTrueVsCommonHandFalse | 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) | TestHandPotentialTrueVsHandPotentialFalse | 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 Mode (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) | TestDefaultVsCluster3Model | Default Opponent Model  Cluster 3 Opponent Model | Player 1 won : 0.6269 +- 0.1059 big blinds per hand |

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# Appendix E

## Validation - Preflop values

Similar strategy used to determine values as for BetPassValues.

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. |

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