eisenberg-noe-2001-debt-model

October 23, 2021

```
-------------------------------------------------------

DEBT MODEL MODE

Running Debt Model in RANDOM mode with 5 nodes…

Scenario 5 - Random Initialisation with 5 nodes, MODE == 'RANDOM', NUM_AGENTS =
5

-------------------------------------------------------

AGENT LABELS

Agent labels ['A', 'B', 'C', 'D', 'E']

-------------------------------------------------------

NOMINAL LIABILITY MATRIX Data Frame
i.e. what node i expects to pay node j…

   A  B  C  D  E
A  0  9  6  1  2
B  4  0  8  5  6
C  8  1  0  8  2
D  8  8  2  0  2
E  3  4  2  2  0


Nominal liabilities for each node:
Liability of Node A to Node B is 9
Liability of Node A to Node C is 6
Liability of Node A to Node D is 1
Liability of Node A to Node E is 2
Liability of Node B to Node A is 4
Liability of Node B to Node C is 8
Liability of Node B to Node D is 5
Liability of Node B to Node E is 6
Liability of Node C to Node A is 8
```

```
Liability of Node C to Node B is 1
Liability of Node C to Node D is 8
Liability of Node C to Node E is 2
Liability of Node D to Node A is 8
Liability of Node D to Node B is 8
Liability of Node D to Node C is 2
Liability of Node D to Node E is 2
Liability of Node E to Node A is 3
Liability of Node E to Node B is 4
Liability of Node E to Node C is 2
Liability of Node E to Node D is 2

NOMINAL LIABILITY MATRIX TRANSPOSED Data Frame
i.e. what node j expects to receive from i…

   A  B  C  D  E
A  0  4  8  8  3
B  9  0  1  8  4
C  6  8  0  2  2
D  1  5  8  0  2
E  2  6  2  2  0


Node A expects to receive 4 from Node B
Node A expects to receive 8 from Node C
Node A expects to receive 8 from Node D
Node A expects to receive 3 from Node E
Node B expects to receive 9 from Node A
Node B expects to receive 1 from Node C
Node B expects to receive 8 from Node D
Node B expects to receive 4 from Node E
Node C expects to receive 6 from Node A
Node C expects to receive 8 from Node B
Node C expects to receive 2 from Node D
Node C expects to receive 2 from Node E
Node D expects to receive 1 from Node A
Node D expects to receive 5 from Node B
Node D expects to receive 8 from Node C
Node D expects to receive 2 from Node E
Node E expects to receive 2 from Node A
Node E expects to receive 6 from Node B
Node E expects to receive 2 from Node C
Node E expects to receive 2 from Node D

-----------------------------------------------------

OPERATING CASH FLOW VECTOR

Exogenous cash flow for Node A: 9
```

```
Exogenous cash flow for Node B: 10
Exogenous cash flow for Node C: 10
Exogenous cash flow for Node D: 3
Exogenous cash flow for Node E: 9
[9, 10, 10, 3, 9]

------------------------------------------------------

CALCULATING RELATIVE LIABILITIES FOR EACH NODE

***Node A***

- Liabilities for Node A
Liability of Node A to Node B (i.e. P_01) is 9.0
Liability of Node A to Node C (i.e. P_02) is 6.0
Liability of Node A to Node D (i.e. P_03) is 1.0
Liability of Node A to Node E (i.e. P_04) is 2.0

- Total obligations for Node A
Total Obligation Vector updated in round 1 for Node A with value 18.0
Total nominal liabilities for Node A (i.e. p_bar_1) is 18.0

- Relative Liabilities of Node A
Relative Liability of Node A to Node B is 0.5
Relative Liability of Node A to Node C is 0.3333333333333333
Relative Liability of Node A to Node D is 0.05555555555555555
Relative Liability of Node A to Node E is 0.1111111111111111
Sum of Relative Liabilities for Node A is 1.0

***Node B***

- Liabilities for Node B
Liability of Node B to Node A (i.e. P_10) is 4.0
Liability of Node B to Node C (i.e. P_12) is 8.0
Liability of Node B to Node D (i.e. P_13) is 5.0
Liability of Node B to Node E (i.e. P_14) is 6.0

- Total obligations for Node B
Total Obligation Vector updated in round 1 for Node B with value 23.0
Total nominal liabilities for Node B (i.e. p_bar_2) is 23.0

- Relative Liabilities of Node B
Relative Liability of Node B to Node A is 0.17391304347826086
Relative Liability of Node B to Node C is 0.34782608695652173
Relative Liability of Node B to Node D is 0.21739130434782608
Relative Liability of Node B to Node E is 0.2608695652173913
Sum of Relative Liabilities for Node B is 1.0
```

```
***Node C***

- Liabilities for Node C
Liability of Node C to Node A (i.e. P_20) is 8.0
Liability of Node C to Node B (i.e. P_21) is 1.0
Liability of Node C to Node D (i.e. P_23) is 8.0
Liability of Node C to Node E (i.e. P_24) is 2.0

- Total obligations for Node C
Total Obligation Vector updated in round 1 for Node C with value 19.0
Total nominal liabilities for Node C (i.e. p_bar_3) is 19.0

- Relative Liabilities of Node C
Relative Liability of Node C to Node A is 0.42105263157894735
Relative Liability of Node C to Node B is 0.05263157894736842
Relative Liability of Node C to Node D is 0.42105263157894735
Relative Liability of Node C to Node E is 0.10526315789473684
Sum of Relative Liabilities for Node C is 0.9999999999999999

***Node D***

- Liabilities for Node D
Liability of Node D to Node A (i.e. P_30) is 8.0
Liability of Node D to Node B (i.e. P_31) is 8.0
Liability of Node D to Node C (i.e. P_32) is 2.0
Liability of Node D to Node E (i.e. P_34) is 2.0

- Total obligations for Node D
Total Obligation Vector updated in round 1 for Node D with value 20.0
Total nominal liabilities for Node D (i.e. p_bar_4) is 20.0

- Relative Liabilities of Node D
Relative Liability of Node D to Node A is 0.4
Relative Liability of Node D to Node B is 0.4
Relative Liability of Node D to Node C is 0.1
Relative Liability of Node D to Node E is 0.1
Sum of Relative Liabilities for Node D is 1.0

***Node E***

- Liabilities for Node E
Liability of Node E to Node A (i.e. P_40) is 3.0
Liability of Node E to Node B (i.e. P_41) is 4.0
Liability of Node E to Node C (i.e. P_42) is 2.0
Liability of Node E to Node D (i.e. P_43) is 2.0

- Total obligations for Node E
Total Obligation Vector updated in round 1 for Node E with value 11.0
```

```
Total nominal liabilities for Node E (i.e. p_bar_5) is 11.0

- Relative Liabilities of Node E
Relative Liability of Node E to Node A is 0.2727272727272727
Relative Liability of Node E to Node B is 0.36363636363636365
Relative Liability of Node E to Node C is 0.18181818181818182
Relative Liability of Node E to Node D is 0.18181818181818182
Sum of Relative Liabilities for Node E is 1.0

------------------------------------------------------------

RELATIVE LIABILITY MATRIX Data Frame

          A         B         C         D         E
A  0.000000  0.500000  0.333333  0.055556  0.111111
B  0.173913  0.000000  0.347826  0.217391  0.260870
C  0.421053  0.052632  0.000000  0.421053  0.105263
D  0.400000  0.400000  0.100000  0.000000  0.100000
E  0.272727  0.363636  0.181818  0.181818  0.000000



------------------------------------------------------------

RELATIVE LIABILITY MATRIX Data Frame SANITY CHECK

          A         B         C         D         E  Relative Liability Total  \
A  0.000000  0.500000  0.333333  0.055556  0.111111                          1.0
B  0.173913  0.000000  0.347826  0.217391  0.260870                          1.0
C  0.421053  0.052632  0.000000  0.421053  0.105263                          1.0
D  0.400000  0.400000  0.100000  0.000000  0.100000                          1.0
E  0.272727  0.363636  0.181818  0.181818  0.000000                          1.0

   CORRECT VALUE?
A            True
B            True
C           False
D            True
E            True



------------------------------------------------------------

RELATIVE LIABILITY MATRIX TRANSPOSED Data Frame
i.e. what node i expects to receive from j in relative terms…

          A         B         C    D         E
A  0.000000  0.173913  0.421053  0.4  0.272727
B  0.500000  0.000000  0.052632  0.4  0.363636
```

```
C  0.333333  0.347826  0.000000  0.1  0.181818
D  0.055556  0.217391  0.421053  0.0  0.181818
E  0.111111  0.260870  0.105263  0.1  0.000000


***Expected nominal payments in for Node A - both proportion and total amount***

Node A expects to receive proportion 0.17391304347826086 from Node B
Node A expects to receive proportion 0.42105263157894735 from Node C
Node A expects to receive proportion 0.4 from Node D
Node A expects to receive proportion 0.2727272727272727 from Node E
Total payments in to Node A is 23.0

***Expected nominal payments in for Node B - both proportion and total amount***

Node B expects to receive proportion 0.5 from Node A
Node B expects to receive proportion 0.05263157894736842 from Node C
Node B expects to receive proportion 0.4 from Node D
Node B expects to receive proportion 0.36363636363636365 from Node E
Total payments in to Node B is 22.0

***Expected nominal payments in for Node C - both proportion and total amount***

Node C expects to receive proportion 0.3333333333333333 from Node A
Node C expects to receive proportion 0.34782608695652173 from Node B
Node C expects to receive proportion 0.1 from Node D
Node C expects to receive proportion 0.18181818181818182 from Node E
Total payments in to Node C is 18.0

***Expected nominal payments in for Node D - both proportion and total amount***

Node D expects to receive proportion 0.05555555555555555 from Node A
Node D expects to receive proportion 0.21739130434782608 from Node B
Node D expects to receive proportion 0.42105263157894735 from Node C
Node D expects to receive proportion 0.18181818181818182 from Node E
Total payments in to Node D is 16.0

***Expected nominal payments in for Node E - both proportion and total amount***

Node E expects to receive proportion 0.1111111111111111 from Node A
Node E expects to receive proportion 0.2608695652173913 from Node B
Node E expects to receive proportion 0.10526315789473684 from Node C
Node E expects to receive proportion 0.1 from Node D
Total payments in to Node E is 12.0

-----------------------------------------------------
```

```
--------------------------------------------------------

START OF ROUND 1

--------------------------------------------------------

TOTAL OBLIGATION VECTOR

i.e. total nominal obligations for each node i.e. p_bar_i…
Total nominal obligation for Node A (i.e. p_bar_1): 18.0
Total nominal obligation for Node B (i.e. p_bar_2): 23.0
Total nominal obligation for Node C (i.e. p_bar_3): 19.0
Total nominal obligation for Node D (i.e. p_bar_4): 20.0
Total nominal obligation for Node E (i.e. p_bar_5): 11.0

--------------------------------------------------------

TOTAL PAYMENT MADE PER NODE

i.e. min[nominal obligations, cashflow (payments in + exogenous cash flow)] for
each node…

***Node A***

- Total payments in for Node A
Total payments in to Node A is 23.0

- Liabilities for Node A
Liability of Node A to Node B (i.e. P_01) is 9.0
Liability of Node A to Node C (i.e. P_02) is 6.0
Liability of Node A to Node D (i.e. P_03) is 1.0
Liability of Node A to Node E (i.e. P_04) is 2.0

- Total obligations for Node A
Total nominal liabilities for Node A (i.e. p_bar_1) is 18.0
Payment out is min[payment out, total cash flow] i.e. min[18.0, 32.0]

 - Total Dollar Payment Vector for round 1 and Node A
Total Dollar Payment Vector for round 1 and Node A updated with value 18.0

***Node B***

- Total payments in for Node B
Total payments in to Node B is 22.0

- Liabilities for Node B
Liability of Node B to Node A (i.e. P_10) is 4.0
```

```
Liability of Node B to Node C (i.e. P_12) is 8.0
Liability of Node B to Node D (i.e. P_13) is 5.0
Liability of Node B to Node E (i.e. P_14) is 6.0

- Total obligations for Node B
Total nominal liabilities for Node B (i.e. p_bar_2) is 23.0
Payment out is min[payment out, total cash flow] i.e. min[23.0, 32.0]

 - Total Dollar Payment Vector for round 1 and Node B
Total Dollar Payment Vector for round 1 and Node B updated with value 23.0

***Node C***

- Total payments in for Node C
Total payments in to Node C is 18.0

- Liabilities for Node C
Liability of Node C to Node A (i.e. P_20) is 8.0
Liability of Node C to Node B (i.e. P_21) is 1.0
Liability of Node C to Node D (i.e. P_23) is 8.0
Liability of Node C to Node E (i.e. P_24) is 2.0

- Total obligations for Node C
Total nominal liabilities for Node C (i.e. p_bar_3) is 19.0
Payment out is min[payment out, total cash flow] i.e. min[19.0, 28.0]

 - Total Dollar Payment Vector for round 1 and Node C
Total Dollar Payment Vector for round 1 and Node C updated with value 19.0

***Node D***

- Total payments in for Node D
Total payments in to Node D is 16.0

- Liabilities for Node D
Liability of Node D to Node A (i.e. P_30) is 8.0
Liability of Node D to Node B (i.e. P_31) is 8.0
Liability of Node D to Node C (i.e. P_32) is 2.0
Liability of Node D to Node E (i.e. P_34) is 2.0

- Total obligations for Node D
Total nominal liabilities for Node D (i.e. p_bar_4) is 20.0
Payment out is min[payment out, total cash flow] i.e. min[20.0, 19.0]
Round 1 and Node D has defaulted due to nominal obligations 20.0 being greater
than cash flow 19.0

 - Total Dollar Payment Vector for round 1 and Node D
Total Dollar Payment Vector for round 1 and Node D updated with value 19.0
```

```
***Node E***

- Total payments in for Node E
Total payments in to Node E is 12.0

- Liabilities for Node E
Liability of Node E to Node A (i.e. P_40) is 3.0
Liability of Node E to Node B (i.e. P_41) is 4.0
Liability of Node E to Node C (i.e. P_42) is 2.0
Liability of Node E to Node D (i.e. P_43) is 2.0

- Total obligations for Node E
Total nominal liabilities for Node E (i.e. p_bar_5) is 11.0
Payment out is min[payment out, total cash flow] i.e. min[11.0, 21.0]

 - Total Dollar Payment Vector for round 1 and Node E
Total Dollar Payment Vector for round 1 and Node E updated with value 11.0

------------------------------------------------------

TOTAL PAYMENT VECTOR

Total payment by Node A (i.e. p_1): 18.0
Total payment by Node B (i.e. p_2): 23.0
Total payment by Node C (i.e. p_3): 19.0
Total payment by Node D (i.e. p_4): 19.0
Total payment by Node E (i.e. p_5): 11.0
[18.0, 23.0, 19.0, 19.0, 11.0]

------------------------------------------------------

UPDATE EQUITY FOR EACH NODE

Total payments in to Node A is 23.0
Total dollar payment by Node A (i.e. p_1) is 18.0

 - Equity Vector for round 1 and Node A
Equity Vector for round 1 and Node A updated with value 32.0
Total payments in to Node B is 22.0
Total dollar payment by Node B (i.e. p_2) is 23.0

 - Equity Vector for round 1 and Node B
Equity Vector for round 1 and Node B updated with value 32.0
Total payments in to Node C is 18.0
Total dollar payment by Node C (i.e. p_3) is 19.0

 - Equity Vector for round 1 and Node C
```

```
Equity Vector for round 1 and Node C updated with value 28.0
Total payments in to Node D is 16.0
Total dollar payment by Node D (i.e. p_4) is 19.0

 - Equity Vector for round 1 and Node D
Equity Vector for round 1 and Node D updated with value 19.0
Total payments in to Node E is 12.0
Total dollar payment by Node E (i.e. p_5) is 11.0

 - Equity Vector for round 1 and Node E
Equity Vector for round 1 and Node E updated with value 21.0

-----------------------------------------------------

EQUITY FOR EACH NODE

Equity for Node A: 32.0
Equity for Node B: 32.0
Equity for Node C: 28.0
Equity for Node D: 19.0
Equity for Node E: 21.0
[32.0, 32.0, 28.0, 19.0, 21.0]

-----------------------------------------------------

ROUND 1 DEFAULTERS

Node D has defaulted in round 1
{'A': False, 'B': False, 'C': False, 'D': True, 'E': False}
There are defaulters in this round (i.e. round 1), algorithm will proceed for
another round.

-----------------------------------------------------

END OF ROUND 1

-----------------------------------------------------

START OF ROUND 2

-----------------------------------------------------

TOTAL OBLIGATION VECTOR

i.e. total nominal obligations for each node i.e. p_bar_i…
Total nominal obligation for Node A (i.e. p_bar_1): 18.0
Total nominal obligation for Node B (i.e. p_bar_2): 23.0
Total nominal obligation for Node C (i.e. p_bar_3): 19.0
```

```
Total nominal obligation for Node D (i.e. p_bar_4): 20.0
Total nominal obligation for Node E (i.e. p_bar_5): 11.0

-------------------------------------------------------

TOTAL PAYMENT MADE PER NODE

i.e. min[nominal obligations, cashflow (payments in + exogenous cash flow)] for
each node…

***Node A***

- Total payments in for Node A
Relative Payment in to Node A from Node B is 0.17391304347826086
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node A from Node C is 0.42105263157894735
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node A from Node D is 0.4
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node A from Node E is 0.2727272727272727
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node A is 22.6

- Liabilities for Node A
Liability of Node A to Node B (i.e. P_01) is 9.0
Liability of Node A to Node C (i.e. P_02) is 6.0
Liability of Node A to Node D (i.e. P_03) is 1.0
Liability of Node A to Node E (i.e. P_04) is 2.0
Total nominal liabilities for Node A (i.e. p_bar_1) is 18.0
Payment out is min[payment out, total cash flow] i.e. min[18.0, 31.6]

 - Total Dollar Payment Vector for round 2 and Node A
Total Dollar Payment Vector for round 2 and Node A updated with value 18.0

***Node B***

- Total payments in for Node B
Relative Payment in to Node B from Node A is 0.5
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node B from Node C is 0.05263157894736842
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node B from Node D is 0.4
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node B from Node E is 0.36363636363636365
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node B is 21.6

- Liabilities for Node B
```

```
Liability of Node B to Node A (i.e. P_10) is 4.0
Liability of Node B to Node C (i.e. P_12) is 8.0
Liability of Node B to Node D (i.e. P_13) is 5.0
Liability of Node B to Node E (i.e. P_14) is 6.0
Total nominal liabilities for Node B (i.e. p_bar_2) is 23.0
Payment out is min[payment out, total cash flow] i.e. min[23.0, 31.6]

 - Total Dollar Payment Vector for round 2 and Node B
Total Dollar Payment Vector for round 2 and Node B updated with value 23.0

***Node C***

- Total payments in for Node C
Relative Payment in to Node C from Node A is 0.3333333333333333
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node C from Node B is 0.34782608695652173
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node C from Node D is 0.1
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node C from Node E is 0.18181818181818182
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node C is 17.9

- Liabilities for Node C
Liability of Node C to Node A (i.e. P_20) is 8.0
Liability of Node C to Node B (i.e. P_21) is 1.0
Liability of Node C to Node D (i.e. P_23) is 8.0
Liability of Node C to Node E (i.e. P_24) is 2.0
Total nominal liabilities for Node C (i.e. p_bar_3) is 19.0
Payment out is min[payment out, total cash flow] i.e. min[19.0, 27.9]

 - Total Dollar Payment Vector for round 2 and Node C
Total Dollar Payment Vector for round 2 and Node C updated with value 19.0

***Node D***

- Total payments in for Node D
Relative Payment in to Node D from Node A is 0.05555555555555555
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node D from Node B is 0.21739130434782608
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node D from Node C is 0.42105263157894735
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node D from Node E is 0.18181818181818182
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node D is 16.0

- Liabilities for Node D
```

```
Liability of Node D to Node A (i.e. P_30) is 8.0
Liability of Node D to Node B (i.e. P_31) is 8.0
Liability of Node D to Node C (i.e. P_32) is 2.0
Liability of Node D to Node E (i.e. P_34) is 2.0
Total nominal liabilities for Node D (i.e. p_bar_4) is 20.0
Payment out is min[payment out, total cash flow] i.e. min[20.0, 19.0]
Round 2 and Node D has defaulted due to nominal obligations 20.0 being greater
than cash flow 19.0

 - Total Dollar Payment Vector for round 2 and Node D
Total Dollar Payment Vector for round 2 and Node D updated with value 19.0

***Node E***

- Total payments in for Node E
Relative Payment in to Node E from Node A is 0.1111111111111111
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node E from Node B is 0.2608695652173913
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node E from Node C is 0.10526315789473684
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node E from Node D is 0.1
Total dollar payment by Node D (i.e. p_4) is 19.0
Total payments in to Node E is 11.9

- Liabilities for Node E
Liability of Node E to Node A (i.e. P_40) is 3.0
Liability of Node E to Node B (i.e. P_41) is 4.0
Liability of Node E to Node C (i.e. P_42) is 2.0
Liability of Node E to Node D (i.e. P_43) is 2.0
Total nominal liabilities for Node E (i.e. p_bar_5) is 11.0
Payment out is min[payment out, total cash flow] i.e. min[11.0, 20.9]

 - Total Dollar Payment Vector for round 2 and Node E
Total Dollar Payment Vector for round 2 and Node E updated with value 11.0

--------------------------------------------------------

TOTAL PAYMENT VECTOR

Total payment by Node A (i.e. p_1): 18.0
Total payment by Node B (i.e. p_2): 23.0
Total payment by Node C (i.e. p_3): 19.0
Total payment by Node D (i.e. p_4): 19.0
Total payment by Node E (i.e. p_5): 11.0
[18.0, 23.0, 19.0, 19.0, 11.0]

--------------------------------------------------------
```

```
UPDATE EQUITY FOR EACH NODE

Relative Payment in to Node A from Node B is 0.17391304347826086
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node A from Node C is 0.42105263157894735
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node A from Node D is 0.4
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node A from Node E is 0.2727272727272727
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node A is 22.6
Total dollar payment by Node A (i.e. p_1) is 18.0

 - Equity Vector for round 2 and Node A
Equity Vector for round 2 and Node A updated with value 31.6
Relative Payment in to Node B from Node A is 0.5
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node B from Node C is 0.05263157894736842
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node B from Node D is 0.4
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node B from Node E is 0.36363636363636365
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node B is 21.6
Total dollar payment by Node B (i.e. p_2) is 23.0

 - Equity Vector for round 2 and Node B
Equity Vector for round 2 and Node B updated with value 31.6
Relative Payment in to Node C from Node A is 0.3333333333333333
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node C from Node B is 0.34782608695652173
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node C from Node D is 0.1
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node C from Node E is 0.18181818181818182
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node C is 17.9
Total dollar payment by Node C (i.e. p_3) is 19.0

 - Equity Vector for round 2 and Node C
Equity Vector for round 2 and Node C updated with value 27.9
Relative Payment in to Node D from Node A is 0.05555555555555555
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node D from Node B is 0.21739130434782608
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node D from Node C is 0.42105263157894735
Total dollar payment by Node C (i.e. p_3) is 19.0
```

```
Relative Payment in to Node D from Node E is 0.18181818181818182
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node D is 16.0
Total dollar payment by Node D (i.e. p_4) is 19.0

 - Equity Vector for round 2 and Node D
Equity Vector for round 2 and Node D updated with value 19.0
Relative Payment in to Node E from Node A is 0.1111111111111111
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node E from Node B is 0.2608695652173913
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node E from Node C is 0.10526315789473684
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node E from Node D is 0.1
Total dollar payment by Node D (i.e. p_4) is 19.0
Total payments in to Node E is 11.9
Total dollar payment by Node E (i.e. p_5) is 11.0

 - Equity Vector for round 2 and Node E
Equity Vector for round 2 and Node E updated with value 20.9

-----------------------------------------------------------

EQUITY FOR EACH NODE

Equity for Node A: 31.6
Equity for Node B: 31.6
Equity for Node C: 27.9
Equity for Node D: 19.0
Equity for Node E: 20.9
[31.6, 31.6, 27.9, 19.0, 20.9]

-----------------------------------------------------------

ROUND 2 DEFAULTERS

Node D has defaulted in round 2
{'A': False, 'B': False, 'C': False, 'D': True, 'E': False}
There are defaulters from earlier rounds but no new defaulters in the current
round, algorithm will not proceed for another round.

***Checking limited liability and absolute priority for Node A***

Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node A from Node B is 0.17391304347826086
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node A from Node C is 0.42105263157894735
Total dollar payment by Node C (i.e. p_3) is 19.0
```

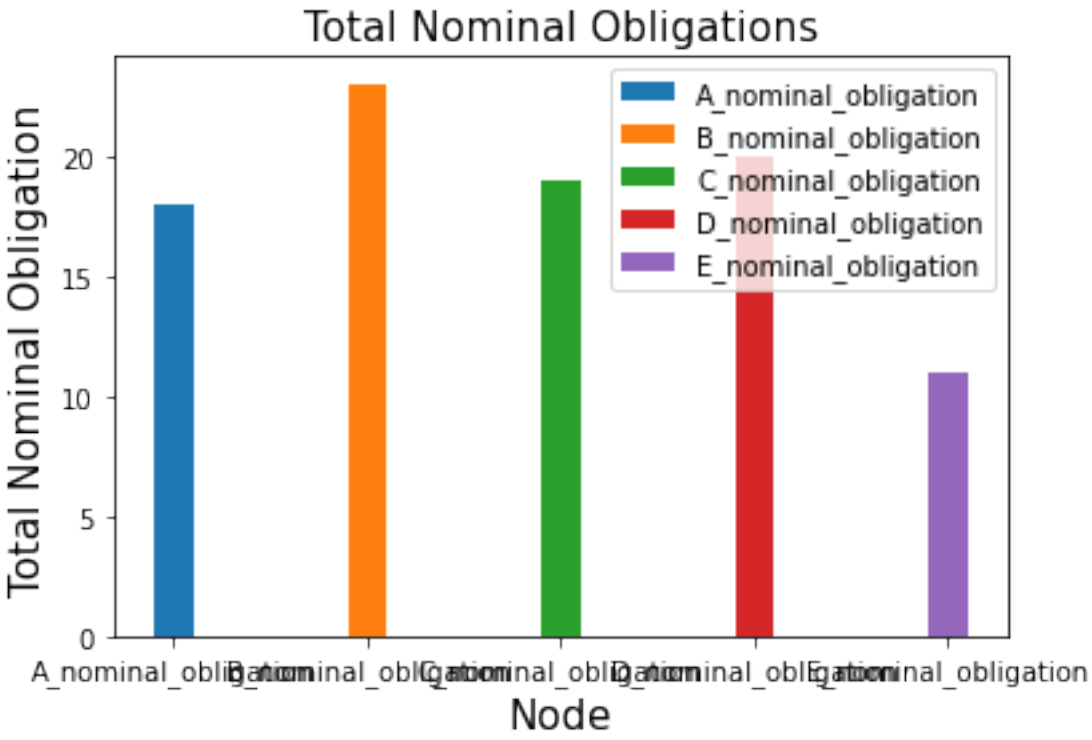
```
Relative Payment in to Node A from Node D is 0.4
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node A from Node E is 0.2727272727272727
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node A is 22.6

- Limited liability is met. Node A made a payment of 18.0 in round 2 which is
less than or equal to the cash flow (payments in + exogenous cash) of 31.6.
Total nominal obligation for Node A (i.e. p_bar_1): 18.0
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node A from Node B is 0.17391304347826086
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node A from Node C is 0.42105263157894735
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node A from Node D is 0.4
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node A from Node E is 0.2727272727272727
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node A is 22.6

 -Checking absolute priority for Node A in round 2. Nominal obligations is 18.0
and Dollar payments is 18.0
-Absolute priority is satisfied for Node A

- Absolute priority is met by Node A in round 2 i.e. either obligations are paid
in full or all available cash flow (i.e. sum of the payments received by the
node plus the exogenous operating cash flow) is paid to creditors. Nominal
obligations were 18.0,  Dollar payment was 18.0 and Total cash flow was 31.6

Node A in round 2 passes candidate clearing vector payment entry checks.

***Checking limited liability and absolute priority for Node B***

Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node B from Node A is 0.5
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node B from Node C is 0.05263157894736842
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node B from Node D is 0.4
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node B from Node E is 0.36363636363636365
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node B is 21.6

- Limited liability is met. Node B made a payment of 23.0 in round 2 which is
less than or equal to the cash flow (payments in + exogenous cash) of 31.6.
Total nominal obligation for Node B (i.e. p_bar_2): 23.0
Total dollar payment by Node B (i.e. p_2) is 23.0
```

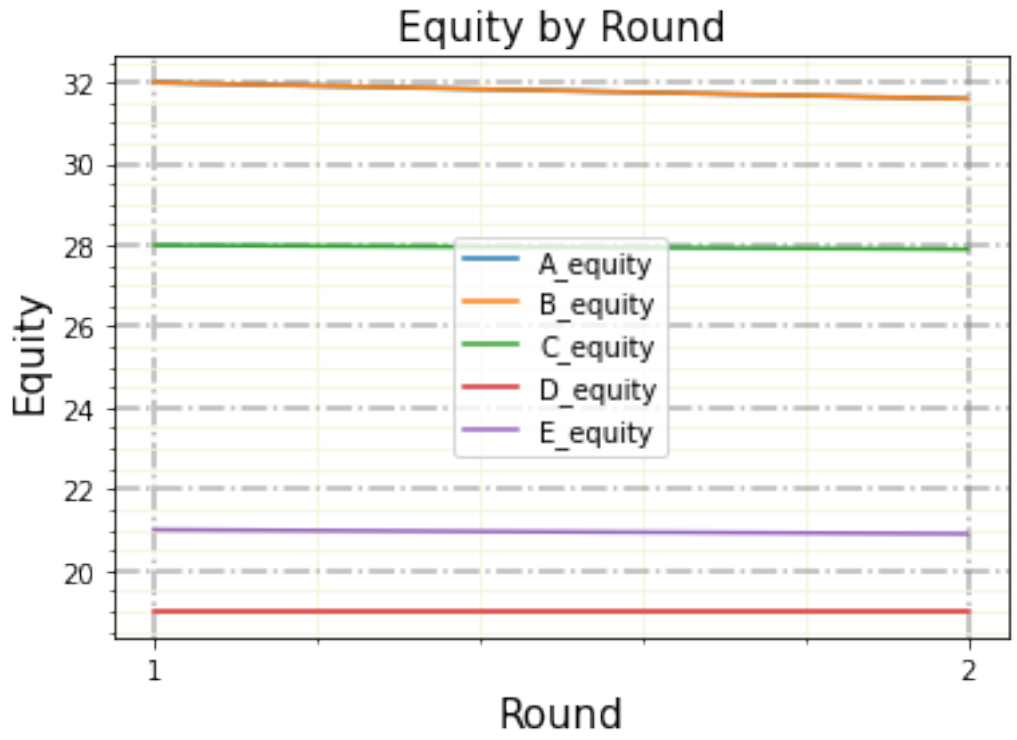
```
Relative Payment in to Node B from Node A is 0.5
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node B from Node C is 0.05263157894736842
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node B from Node D is 0.4
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node B from Node E is 0.36363636363636365
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node B is 21.6

 -Checking absolute priority for Node B in round 2. Nominal obligations is 23.0
and Dollar payments is 23.0
-Absolute priority is satisfied for Node B

- Absolute priority is met by Node B in round 2 i.e. either obligations are paid
in full or all available cash flow (i.e. sum of the payments received by the
node plus the exogenous operating cash flow) is paid to creditors. Nominal
obligations were 23.0,  Dollar payment was 23.0 and Total cash flow was 31.6

Node B in round 2 passes candidate clearing vector payment entry checks.

***Checking limited liability and absolute priority for Node C***

Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node C from Node A is 0.3333333333333333
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node C from Node B is 0.34782608695652173
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node C from Node D is 0.1
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node C from Node E is 0.18181818181818182
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node C is 17.9

- Limited liability is met. Node C made a payment of 19.0 in round 2 which is
less than or equal to the cash flow (payments in + exogenous cash) of 27.9.
Total nominal obligation for Node C (i.e. p_bar_3): 19.0
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node C from Node A is 0.3333333333333333
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node C from Node B is 0.34782608695652173
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node C from Node D is 0.1
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node C from Node E is 0.18181818181818182
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node C is 17.9
```

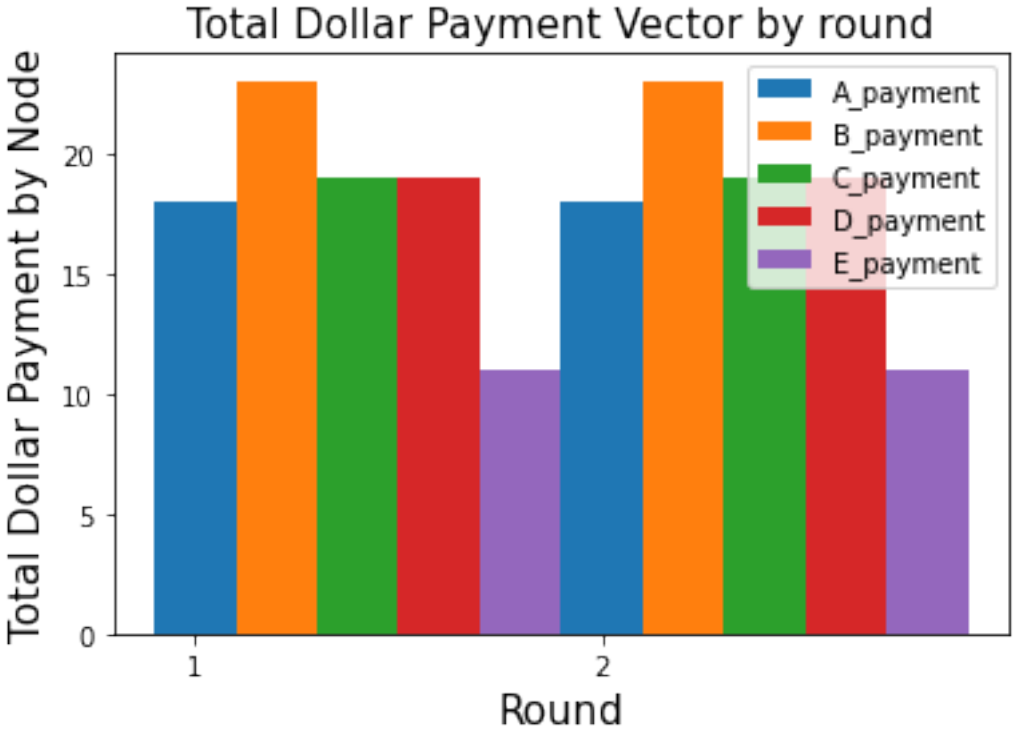
```
 -Checking absolute priority for Node C in round 2. Nominal obligations is 19.0
and Dollar payments is 19.0
-Absolute priority is satisfied for Node C

- Absolute priority is met by Node C in round 2 i.e. either obligations are paid
in full or all available cash flow (i.e. sum of the payments received by the
node plus the exogenous operating cash flow) is paid to creditors. Nominal
obligations were 19.0,  Dollar payment was 19.0 and Total cash flow was 27.9

Node C in round 2 passes candidate clearing vector payment entry checks.

***Checking limited liability and absolute priority for Node D***

Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node D from Node A is 0.05555555555555555
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node D from Node B is 0.21739130434782608
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node D from Node C is 0.42105263157894735
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node D from Node E is 0.18181818181818182
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node D is 16.0

- Limited liability is met. Node D made a payment of 19.0 in round 2 which is
less than or equal to the cash flow (payments in + exogenous cash) of 19.0.
Total nominal obligation for Node D (i.e. p_bar_4): 20.0
Total dollar payment by Node D (i.e. p_4) is 19.0
Relative Payment in to Node D from Node A is 0.05555555555555555
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node D from Node B is 0.21739130434782608
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node D from Node C is 0.42105263157894735
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node D from Node E is 0.18181818181818182
Total dollar payment by Node E (i.e. p_5) is 11.0
Total payments in to Node D is 16.0

 -Checking absolute priority for Node D in round 2. Nominal obligations is 20.0
and Dollar payments is 19.0
Dollar payments less than nominal obligations. Now checking if all value is paid
to creditors, i.e. Total cash flow for Node D
All value i.e. cash flow available to Node D is 19.0
-Absolute priority is satisfied for Node D

- Absolute priority is met by Node D in round 2 i.e. either obligations are paid
in full or all available cash flow (i.e. sum of the payments received by the
node plus the exogenous operating cash flow) is paid to creditors. Nominal
```

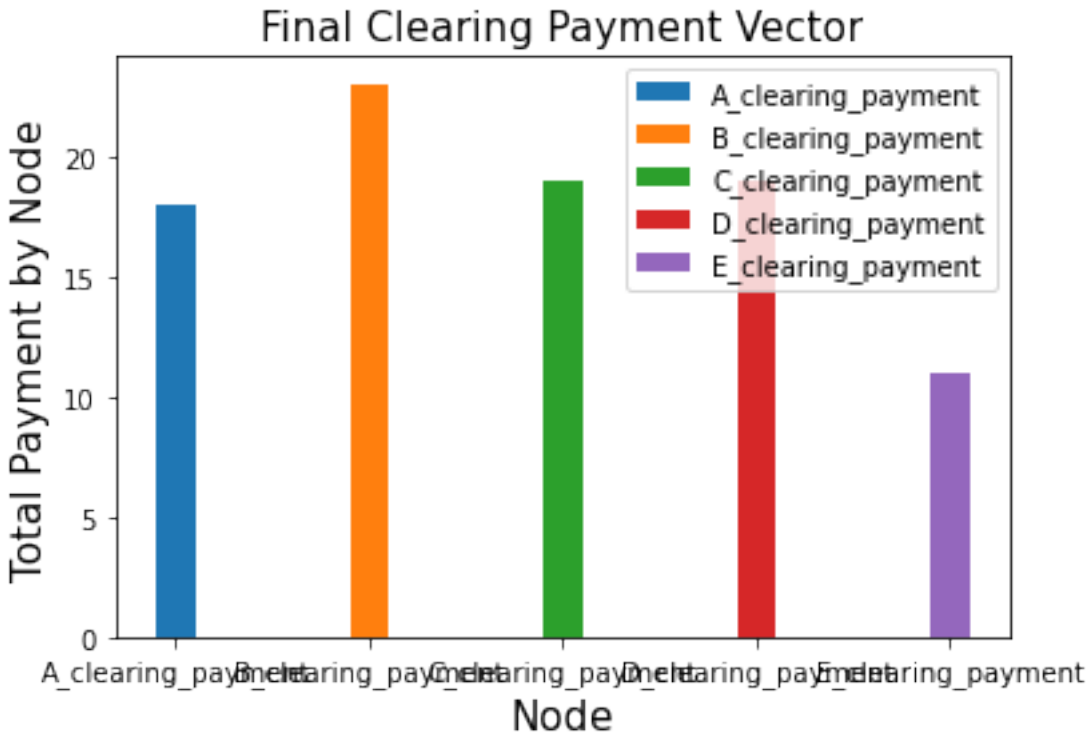
```
obligations were 20.0,  Dollar payment was 19.0 and Total cash flow was 19.0

Node D in round 2 passes candidate clearing vector payment entry checks.

***Checking limited liability and absolute priority for Node E***

Total dollar payment by Node E (i.e. p_5) is 11.0
Relative Payment in to Node E from Node A is 0.1111111111111111
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node E from Node B is 0.2608695652173913
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node E from Node C is 0.10526315789473684
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node E from Node D is 0.1
Total dollar payment by Node D (i.e. p_4) is 19.0
Total payments in to Node E is 11.9

- Limited liability is met. Node E made a payment of 11.0 in round 2 which is
less than or equal to the cash flow (payments in + exogenous cash) of 20.9.
Total nominal obligation for Node E (i.e. p_bar_5): 11.0
Total dollar payment by Node E (i.e. p_5) is 11.0
Relative Payment in to Node E from Node A is 0.1111111111111111
Total dollar payment by Node A (i.e. p_1) is 18.0
Relative Payment in to Node E from Node B is 0.2608695652173913
Total dollar payment by Node B (i.e. p_2) is 23.0
Relative Payment in to Node E from Node C is 0.10526315789473684
Total dollar payment by Node C (i.e. p_3) is 19.0
Relative Payment in to Node E from Node D is 0.1
Total dollar payment by Node D (i.e. p_4) is 19.0
Total payments in to Node E is 11.9

 -Checking absolute priority for Node E in round 2. Nominal obligations is 11.0
and Dollar payments is 11.0
-Absolute priority is satisfied for Node E

- Absolute priority is met by Node E in round 2 i.e. either obligations are paid
in full or all available cash flow (i.e. sum of the payments received by the
node plus the exogenous operating cash flow) is paid to creditors. Nominal
obligations were 11.0,  Dollar payment was 11.0 and Total cash flow was 20.9

Node E in round 2 passes candidate clearing vector payment entry checks.

-----------------------------------------------------------

CLEARING_PAYMENT_VECTOR

Clearing payment vector found in round 2.
[18.0, 23.0, 19.0, 19.0, 11.0]
```

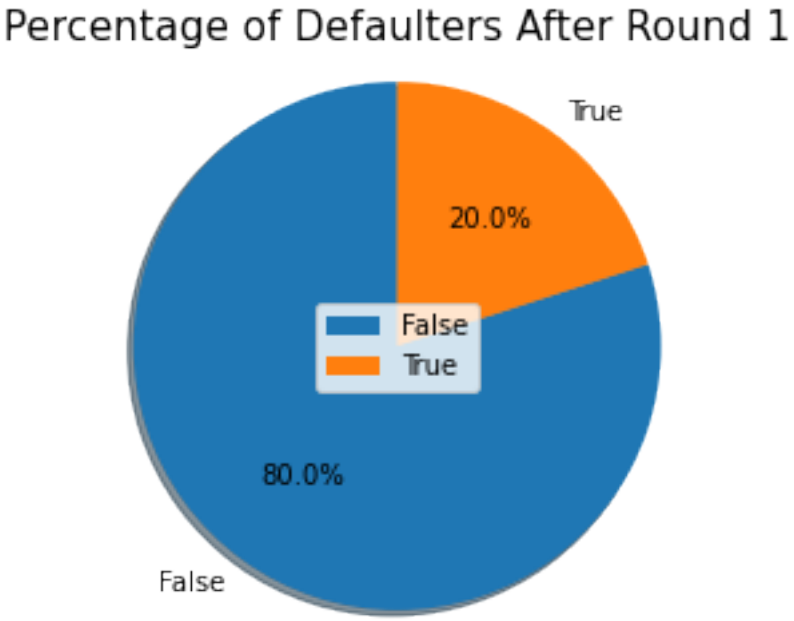
```
Node A pays: 18.0
Node B pays: 23.0
Node C pays: 19.0
Node D pays: 19.0
Node E pays: 11.0

------------------------------------------------------------

END OF ROUND 2
- Systemic Risk: Node D has defaulted in round 1. The number of prior default
waves is 0. There are 5 nodes in the system (0 of which have defaulted i.e. []).
- Systemic Risk: Node A has not defaulted after 2 rounds. There are 5 nodes in
the  system (1 of which have defaulted i.e. ['D']).
- Systemic Risk: Node B has not defaulted after 2 rounds. There are 5 nodes in
the  system (1 of which have defaulted i.e. ['D']).
- Systemic Risk: Node C has not defaulted after 2 rounds. There are 5 nodes in
the  system (1 of which have defaulted i.e. ['D']).
- Systemic Risk: Node E has not defaulted after 2 rounds. There are 5 nodes in
the  system (1 of which have defaulted i.e. ['D']).
```




Equity by Round
Equity
Round
A_equity
B_equity
C_equity
D_equity
E_equity
32
30
28
26
24
22
20
1
2

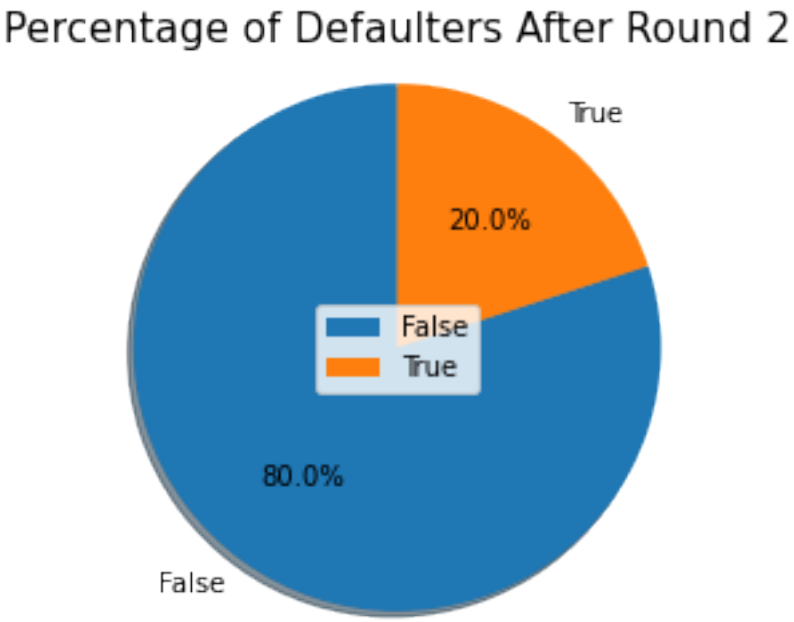

Total Dollar Payment Vector by round
Total Dollar Payment by Node
Round
A_payment
B_payment
C_payment
D_payment
E_payment
20
15
10
5
0
1
2






```
Node A has NOT defaulted in round 1
Node B has NOT defaulted in round 1
```

```
Node C has NOT defaulted in round 1
Node D has defaulted in round 1
Node E has NOT defaulted in round 1
```




```
Node A has NOT defaulted in round 2
Node B has NOT defaulted in round 2
Node C has NOT defaulted in round 2
Node D has defaulted in round 2
Node E has NOT defaulted in round 2
```