Financial Market Infrastructures and Payments: Warehouse Metaphor Textbook
Ron J. Berndsen

Answers to Exercises of Chapter 3

1. In the pure form, DNS collects all transactions in a system during the day and at the end of the day, calculates the multilateral net positions and settles those net positions in one settlement cycle. In the pure form, RTGS settles each individual transaction as soon as it is entered into the system (gross basis).

2. In your own random network:
   (a) pure RTGS is the network with all 9 individual transactions depicted, bilateral netting means to replace mutual transactions between two participants with the net result, multilateral netting means to determine for each participant the total amount of incoming – outgoing payments and then draw the arrows from banks with a negative total amount ('short' banks) to banks with a positive total amount ('long' banks) using as few arrows as possible.
   (b) There is no netting possible if the network consists of only paths of unit length i.e. there is no participant with an incoming *and* an outgoing arrow. Participants are either short (only outgoing arrows), long (only incoming arrows) or flat (no arrows). This also implies that after multilateral netting, the network is acyclic (contains no cycles anymore).
   (c) The solution is to set for all participants the balance of the amount of incoming minus outgoing payments to zero in your network. In the example in the Exhibit on page 31 two transactions can be adapted: increase c → b from 50 to 80 and increase b → a from 90 to 180. In general, multiple solutions exist.

3. The fundamental risk is settlement risk and the three variants are credit risk, liquidity risk and replacement-cost risk (see definition 9). See for some examples page 35- 40 of the book.

4. It is easier to answer this question if you use the template below to keep track of the Settlement Finality status of each individual transaction, in conjunction with the Flowchart in Figure 3.10. The first template below shows the case with no recognition lag which implies that all transactions with the insolvent bank *a* after the opening of the insolvency procedure (45) will be rejected (according to step 8 of the Flowchart). Of course, the transactions among the surviving participants ('50' and '60') will proceed as if nothing had happened.

Insolvency member bank *a* at 45 with recognition lag = 0				
Time	Transaction	SF1	SF2	SF3
0	RTGS opening			
10	10	Yes	Yes	Yes, 10
20	20	Yes	Yes	Yes, 20
30	30	Yes	Yes	Yes, 30
40	40	Yes	Yes	Yes, 40
45 t_i, t_a				
50	50	Yes	Yes	Yes, 50
60	60	Yes	Yes	Yes, 60
70	70	No	No, reject	No
80	80	No	No, reject	No
90	90	No	No, reject	No
95	RTGS closed		**total**	**210 million**

The second template shows the case with a recognition lag of 40 minutes. Assume (a bit counter-intuitive) there is still enough liquidity on the account of bank *a* then transactions '70' and '80' will still settle via step 7 in Figure 3.10 ('proceed').

Insolvency member bank *a* at 45 with recognition lag = 40				
Time	Transaction	SF1	SF2	SF3
0	RTGS opening			
10	10	Yes	Yes	Yes
20	20	Yes	Yes	Yes
30	30	Yes	Yes	Yes
40	40	Yes	Yes	Yes
45 t_i				
50	50	Yes	Yes	Yes
60	60	Yes	Yes	Yes
70	70	No	Yes, proceed	Yes
80	80	No	Yes, proceed	Yes
85 t_a				
90	90	No	No, reject	No
95	RTGS closed		**Total**	**360 million**

5. See definition 10 and the examples provided on pages 39-40.

6. The liquidity-saving mechanism should preserve finality i.e. the re-emergence of credit risk should be prohibited.

7. The following six liquidity-saving mechanisms are mentioned in section 3.5:

All-or-Nothing	technical (algorithm, decided by system operator)
Cycles	technical (algorithm, decided by system operator)
Partial Settlement	technical (algorithm, decided by system operator)
Priority Queues	economic (participant can assign priority to each payment)
Progressive Intraday Pricing	economic (incentive for participants as early payments are cheaper)
Throughput Guidelines	economic (peer review mechanism through transparency)

8.

TARGET2	each eurosystem central bank	CeBM
CLS	CLS Bank	CoBM (but backed up by CeBM)
EURO1	final settlement in TARGET2	CeBM
ACH (€-warehouse)	final settlement in TARGET2	CeBM
Fedwire	US Federal Reserve system	CeBM
respondent bank	commercial bank	CoBM

9. Herstatt risk (credit risk) is eliminated because CLS settles in PvP mode but without settlement guarantee: either the foreign-exchange transactions settles (success case) or both legs of the FX-transaction do not settle (failure case, but no manifestation of credit risk).
   In the latter case it is still possible but unlikely that settlement risk in the form of replacement-cost risk emerges.

10. Euro Central Bank Money is created by the eurosystem central banks in TARGET2 by extending intraday credit to its participants against eligible collateral provided by those participants in advance. The haircut is a percentage reduction of the value of the collateral to protect the central bank against price drops of that collateral. This is to ensure that the value of the collateral is higher than the amount of intraday credit provided.