

Money and Coins

Ec 365
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1

Questions

- What is money?
- Was there money before coins?
- When where coins introduced? Where? Why?
- What types of coins?
- Seignorage: government revenues by money creation
 - How does it work with coins?

Plan

- History
 - Review of unit of account
 - First coins in Lydia
- Standard monetary system with coins (Roman, Middle Ages, Early Modern)
- Seignorage and debasement
 - Theory
 - Data

2

2

Mesopotamia

One shekel = 8.4 gr (~ 40 days of work). 1 talent=60 minas=360 shekels

- ~ 2300 BC Sini-Ishtar has bought a slave, Ea-tappi by name, from Ilu-elatti, and Akhia, his son, and has paid **ten shekels of Silver, the price agreed.** Ilu-elatti, and Akhia, his son, will not set up a future claim on the slave. In the presence of Ilu-iqisha, son of Likua; in the presence of Ilu-iqisha, son of Immeru; in the presence of Likulubishtum, son of Appa, the scribe, who sealed it with the seal of the witnesses. The tenth of Kisilimu, the year when Rim-Sin, the king, overcame the hostile enemies.
- ~ 2000 BC Sini-Ishtar, the son of Ilu-eribu, and Apil-Ili, his brother, have bought one third Shar of land with a house constructed, next the house of Sini-Ishtar, and next the house of Minani; one third Shar of arable land next the house of Sini-Ishtar, which fronts on the street; the property of Minani, the son of Migrat-Sin, from Minani, the son of Migrat-Sin. **They have paid four and a half shekels of silver, the price agreed.** Never shall further claim be made, on account of the house of Minani.

3

Unit of account in Egypt

- Three purposes of money: ?
- Inscription near the sphinx (Khafre, ~ 2500 BCE):

I have purchased this house from the scribe Tjenti. I gave him 10 shats for it; one piece of cloth with four thread (?), 3 shats; one bed, 4 shats; one piece of cloth with two threads (?), 3 shats.
- Money: unit of account
 - Not a store of value
 - Not much precious metal for money
 - Some copper rings ?
 - No trade for money
- This transaction was instant.
 - Not across different times



4

Before coins

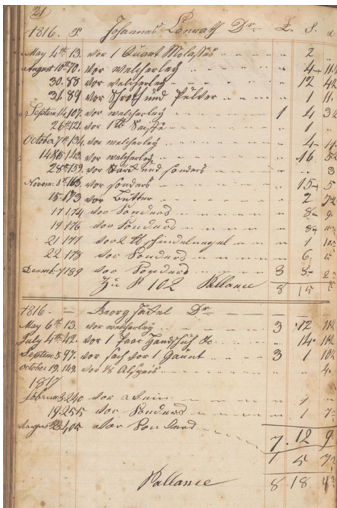
- Barter
- Problem of the double coincidence of wants
 - Reduced profitability of production
- Local trading is possible (examples, see notes)
 - Memory as a substitute for money (Kocherlakota)
 - Keep track of the transactions
 - In modern economy, cash (coins and bills) play a smaller role
 - Some people call for the elimination of cash
- For large transactions or long-distance trade, precious metal can be used for exchange (traded by weight)

5

5

Informal money: the General Stores

- Lack of small change



1816. Johannes Conway. debtor

Date	Ref	Description	Amount
May 4	13	1 Quire Molasses	2
Aug 10	70	one molasses jug	4-11.5
Aug 30	58	one molasses jug	12-4.5
Aug 31	89	one Yard mus & Ribbon	1-11
Sep 14	101	one molasses jug	1-4-3.25
Sep 26	412	one 1/8 sugar	1
Oct 14	134	one molasses jug	4-14.5
Oct 14	485	one molasses jug	16-5.5
Oct 25	159	Hand Gin & Powder	8
Nov 5	163	Powder	15-5
Nov 15	173	whisky	2-7.5
Nov 17	174	Powder	8-9
Nov 19	176	Powder	8-11.5
Nov 21	177	of John McConnell	1-10.5
Nov 22	178	Powder	6-6
Dec 1	189	Powder	3-5-2.5

6

Sardex

Edward Posnett, reporting for the FT, writes: “When the financial crisis hit Sardinia, a group of local friends decided that the best way to help the island was to set up a currency from scratch”.

- Three purposes of money: ?
- Financial crisis of 2008.
- Lack of credit
- Swiss WIR system
- mutual credit system
- resembles early ledger-based system

7

Introduction of coins

- Around 660 BC:
 - First coins around what is now Turkey and Greek islands next to it
 - Mix between gold and silver: **electrum**
 - Found in a natural state, especially in a river near the capital of **Lydia: Sardis**
- Next stage: standardization under Croesus, king of Lydia
(c. 585 – c. 546 BC)

8

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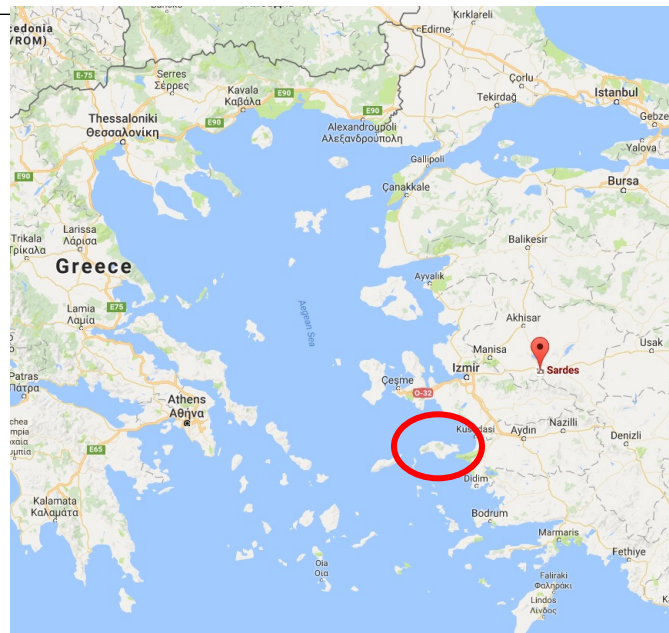
Lydia around 600 BC



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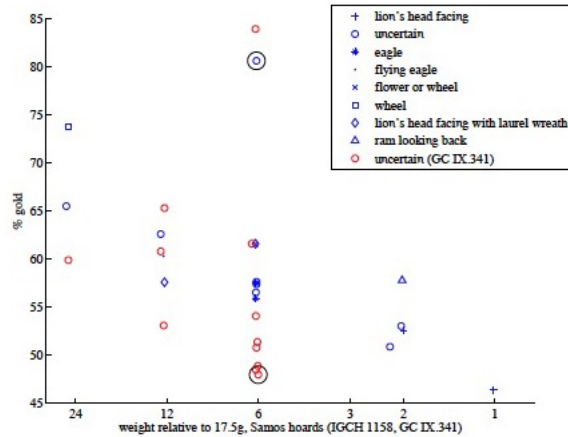
Coin minting in Samos



10

10

Example of coins: the standard of Samos



Velde: the Origin of Specie

11

11

Nature's gift:

Metal	Density	Value	Melting point (C°)
Gold	19.32	1,200	1,063
Silver	10.49	100	900-961*
Copper	8.96	0.6	1,085
Lead	11.35	0.05	327.5
Tin	7.28	3.9	232
Iron	7.85	0.2	1150
Bronze	7.4-8.9	1.0	

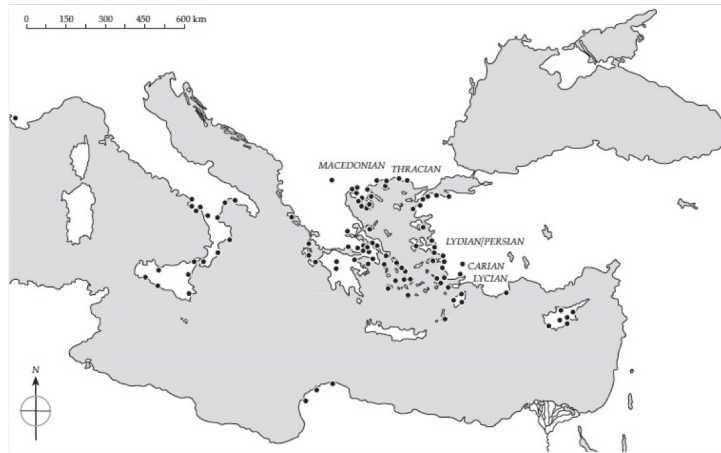
- Reasons for metallic money
- Any metallic system is constrained by the physical properties of the metals, density and scarcity.
 - Price ratio gold/silver: antiquity, 12;
 - Silver (1 gr.): \$ 0.92 ; gold: \$ 80.
- At equal value, during the Roman empire, a gold coin has a volume about 1/25 of a silver coin; with equal thickness, the coin is 5 times smaller.

12

12

Mints around 480 BC

Money is like a language:
it's useful when others use it



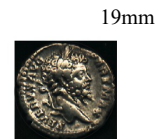
Date benchmark: Battle of Marathon: 490

13

13

Gold and silver coins in the Roman Empire

- ~~Bi-metallic system (theoretically, until the 20th century)~~
 - Small value coins cannot be in gold
 - Large value coins cannot be in silver,
- In Rome (and after)
 - 1 aureus (gold) = 25 denarius (silver) = 100 sesterces (bronze) = 250 asses
 - 1 aureus (40-45 to the Roman pound of 327 gr), about 8gr: \$ 640
 - 1 denarius (silver) : weight? 4.5 grams
 - 1 denarius ~ 1 drachma (Greece), one day work as galley rower
 - Under Augustus, annual pay of legionnaire 9 aureus = 225 denarius (denarii)
 - 4 HS (sesterce) unskilled daily wage
 - Difficulty in comparing developed and underdeveloped economies.



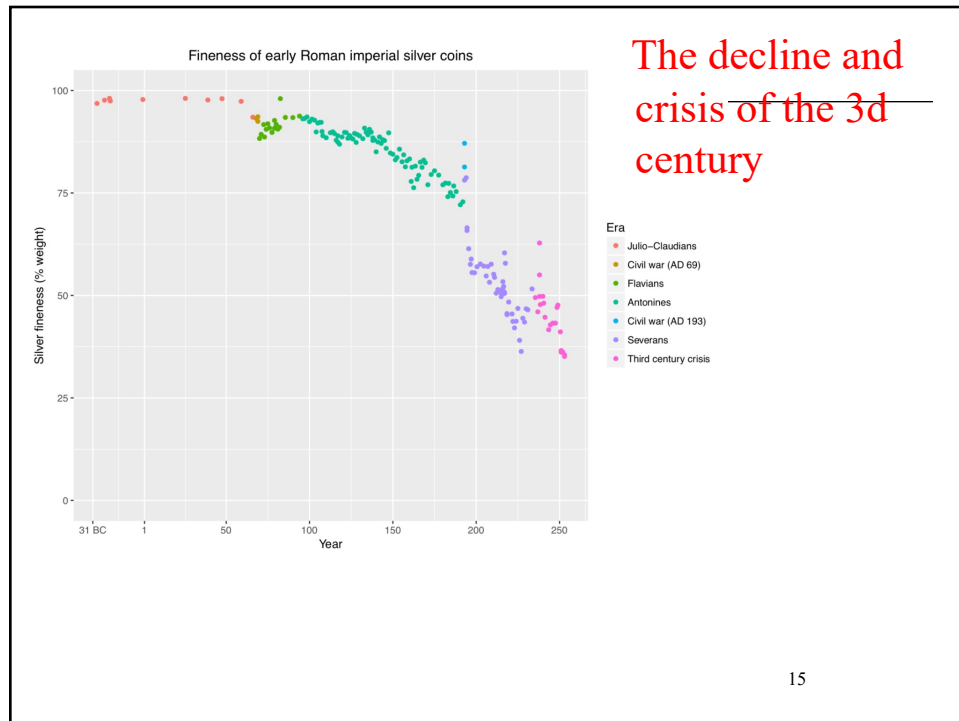
19mm



36mm

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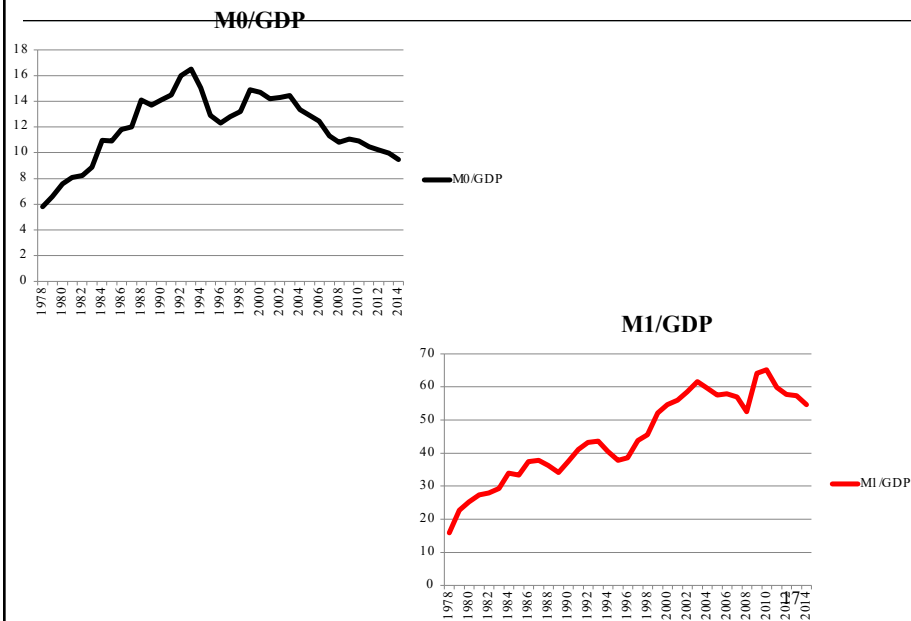
Later..

- England (before February 15, 1971)
 - 1 pound=20 shillings=240 pennies
- France (before 1789)
 - Livre= 20 sols = 240 deniers
- Dinar in Algeria, Tunisia; Dirham in Marocco

16

16

Introduction of money in China after 1978



17

Remarks on metallic money

- Initially, metallic money because of lack of trust
 - Locally (within the same state, say)
 - Internationally (no overall authority, especially important)
- Two types of transactions
 - International (gold coins)
 - Local (silver bronze)

18

18

Seignorage

- Definition of seignorage: government revenue through creation of money
- Today: the printing press
- With coins: reduction of the precious metal
- Distinction between
 - Face value (what is written on the coin): exchange value of the coin
 - Intrinsic value (value of the metal inside)
- The intrinsic value cannot be greater than the face value
 - Gresham Law: bad money chases away good money.
 - Description in Aristophanes (*The Frogs*, 405 BC)
- The face (exchange) value can be higher than the intrinsic value because of its purchasing power

19

19

Coin debasement (1)

- Money is used for *transactions*.
 - We have paper money with no intrinsic value. The value of money is essentially the transaction value. We hold it because we can buy real goods with it. The seller of these goods accepts the paper because he can buy real goods. Etc.... Chain of transactions. If no one at the end, the chain unravels.
- Thought experiment:
 - The emperor buys all the coins and replaces them with paper money
 - What is the impact on the price level?
- Locally (within the same state, say)
- Internationally (no overall authority, especially important)

20

20

Coin debasement and inflation

- Debasement of the currency while keeping the quantity of money constant has NO impact on the price level
- Governments issue more coins with lower silver: the quantity of money increases and THIS creates inflation.
- Inflation is always a monetary process
- The causality is Money creates inflation, NOT the reverse.
- The initial cause is the need for government revenue
- SOME exceptions: the inflow of silver from the Americas to Europe in the 16th century. Prices were multiplied by 4 in a century, but there was NO seigniorage.

21

21

Summary

- Money as unit of account
- Coins begin in 6th century BC
 - Electrum: coins valued “by weight” or “by tale”
 - Separation gold and silver
- Properties of metals
- Standard system with coins
 - High value: gold, why? For what?
 - Lower value: silver
- Seigniorage and debasement
 - On which coin and why?
 - Thought experiments in debasement
- Inflation is always caused by monetary expansion

22

22

Seignorage with coins

- The coin is a mix of silver and copper (similar density)
- To simplify,
 - Say, half/half.
 - One denarius, 4 gr.
 - Market value of 1gr of silver is $\frac{1}{4}$ denarius (one HS)
 - Cost of copper and production equal to zero.
- The intrinsic value of the coin (value if the coin is melted): $\frac{1}{2}$ denarius
- Why does the coin *circulate* (is accepted in the purchase of goods)?
- Because it has a value for transaction. Think of dollar bills today.
- **Seignorage**
- The emperor order a doubling of the quantity of coins, impact?

23

23

Seignorage with coins

- **Impact**
- After adjustment, the price level (the price of all goods, including silver) doubles.
- The intrinsic value of the coin is now 1 denarius.
- Can more coins be made?
- How to make new coins?
- What happens to the "old" coins?

24

24

Seignorage with coins

- The mint has instructions to make coins (mix of silver and copper),
- Coins are defined by two numbers
 - Degree of fineness F : fraction of silver in the mix
 - Number of coins N per pound (or unit-weight) of mix.
 - The face value of the coins (written on its face) f
- Operation of the mint
 1. Buy the silver on the market, at the price P per unit of weight
(in M-A, pound or *marc* which is about 245 grams;
Roman pound 329 gr).
 2. Mix with copper using the degree of fineness F .
Weight of the mix is $1/F$
 3. Make N coins per unit-weight of the mix.
The number of the coins is N/F
 4. The total value of the coins is $L=f \cdot N/F$: the *par value* of the coin

25

25

Profits

- P market price of silver (for a unit weight of one marc): **the mint price**
- $L - P$ = gross profit (per marc [pound] of silver)
- Net profit is
- $L - Q$ - **brassage cost** (i.e. production cost other than silver)

26

26

When does a coin circulate ? (used for exchanges)

- When its intrinsic value is smaller than its face value
- Suppose the price of silver is P livres: the **mint price**.
 - The mint price is the price paid by the mint when purchasing silver.
- Intrinsic value of the coin: $v = F.P / N$
- The coin circulates only if $v < f$
- Condition equivalent to $P < f.N / F$
- The mint price must not be greater than the par price

27

27

	F	N	L	Q	S			
	Percentage	Number	Mint	Mint	Mint	Brassage	Seignorage	
Date	of	of	Par	Price	Charges	Rate	Rate	
	Fineness	Coins	(in	(in	Rate	(%)	(%)	
			livres)	livres)	(%)			
<i>Blanc of 10 Deniers Tournois</i>								
30 Mar. 1412	45.8	74.25	6.75	6.25	7.4	6.5	0.9	
26 Apr. 1412–14 Sept. 1412	41.7	80.00	8.00	6.75	15.6	6.0	9.6	
24 Sept. 1412–23 June 1415	41.7	80.00	8.00	7.00	12.5	6.0	6.5	
28 June 1415–12 June 1417	41.7	80.00	8.00	7.10	11.3	6.0	5.3	
22 June 1417–17 Feb. 1418	33.3	80.00	10.00	8.00	20.0	6.0	14.0	
26 Feb. 1418–16 Oct. 1418	22.2	80.00	15.00	9.00	40.0	6.0	34.0	
12 Nov. 1418–1 Feb. 1419	22.2	80.00	15.00	9.50	36.7	6.0	30.7	
21 Jan. 1419	22.2	80.00	15.00	10.00	33.3	6.0	27.3	
1 Feb. 1419–14 Apr. 1419	22.2	80.00	15.00	11.00	26.7	6.0	20.7	
19 May 1419–24 June 1419	18.8	81.00	18.00	13.00	27.8	5.9	21.9	
<i>Gros of 20 Deniers Tournois</i>								
23 July 1418–3 Nov. 1418	44.4	80.00	15.00	9.00	40.0	3.0	37.0	
12 Nov. 1418–1 Feb. 1419	44.4	80.00	15.00	9.50	36.7	3.0	33.7	
21 Jan. 1419	44.4	80.00	15.00	10.00	33.3	3.0	30.3	
16 Feb. 1419–30 Apr. 1419	44.4	80.00	15.00	11.00	26.7	3.0	23.7	
19 May 1419–24 June 1419	37.5	81.00	18.00	13.00	27.8	3.0	24.8	
21 June 1419	33.3	80.00	20.00	14.00	30.0	3.0	27.0	
4 July 1419	33.3	84.00	21.00	14.00	33.3	2.9	30.4	
4 July 1419–17 Oct. 1419	33.3	84.00	21.00	15.00	28.6	2.9	25.7	
25 Oct. 1419–4 Nov. 1419	27.8	90.00	27.00	15.00	44.4	2.7	41.7	

28

Example

20 Deniers Tournois Mint par L Market price of silver %

Date	F	$N = 1/w$	L	P	S	c	R
23/7/1418-3/11/1418	44.4	80	15.00	9.00	40.0	3.0	37.0
19/5/1419-24/6/1419	37.5	81	18.00	13.00	27.8	3.0	24.8
7/1422-7/10/1422	2.8	120	360.00	90.00	75.0	25.0	50.0

- 1 livre = 240 deniers
- $f = 1/12$
- Intrinsic value of the coin in 1418 :
 - $v = F.P / N = 0.444 \times 9/80 = 1/20 < 1/12$ the coin circulate
 - Verify $L > P$
 - Profit (gross) $S = (L-P)/L$.
 - Profit (net) $R = S - c$
- Intrinsic value of the **same** coin in 1422 :
 - Price of silver
 - Intrinsic value $v = 1/2$
 - Does the coin circulate?

29