

A theory on how the denarius disappeared and the debasement of the antoninianus.

Was the heavy debasement of the denarius during the reign of the emperor Septimius Severus in the late second century ‘the beginning of the end’ for the denarius and the beginning of the decline of the Roman empire? This question was also hidden in the name of the article ‘The Beginning of the End? The Denarius in the Second Century’ by Butcher & Ponting (2012). In my opinion it was not the debasement of the denarius that led to its disappearance but the introduction of the antoninianus and especially the re-introduction of this coin in the reign of the emperors Pupienus and Balbinus. In this article I will try to explain my point of view on the disappearance of the denarius and the debasement of the antoninianus and the consequences. This article is from a chapter of my book I wrote in Dutch, it is rewritten and translated into English.¹

Around the year 229 Cassius Dio wrote in his Roman history that during the reign of the emperor Augustus the aureus was valued at 100 sestertii.² He wrote ‘*I use the name aureus, according to Roman custom, for the coin with a value of 100 sestertii. Some Greeks whose books we read gave the coin his name*’. From the way he formulated this phrase it is thought that at the time he wrote this the value of the aureus had changed. Not its value stated in sestertii but its value in denarii. The value of the aureus expressed in silver denarii probably did not equal 25 pieces any more. The sestertius however stayed in use as the coin that was most often used to express sums of money. A payment expressed in 100 sestertii still equalled one gold aureus. From the year 194 AD on the denarius had become a very debased coin whose fineness had dropped from around 70% under Commodus to 45% under Septimius Severus (Butcher & Ponting 2012). In the year 215 Caracalla introduced a new silver coin worth two denarii but with insufficient silver content to back up this value. He also changed the official weight of the aureus from 45 to 50 to the pound (6.549g). Introducing a new debased coin next to an already debased denarius and changing the weight of the aureus probably did put to much a strain on the monetary system. The public must have become disgruntled and the currency system became instable. Eventually Gresham's law should have driven the denarius out of circulation because in despite of the debased character of the coin it was slightly better than the antoninianus³. There is however no evidence that this already happened in the reign of Caracalla. In the reigns of the emperors Macrinus and Elagabalus the antoninianus continued to be struck but the output of denarii remained higher than the output of antoniniani. It also seems that the denarii of Macrinus had a better fineness than the denarii of Caracalla (see table 1). In despite of lowering the weight of the aureus the ratio 25 denarii or 12½ antoniniani to the aureus could probably not be maintained for long.

It's possible that a real monetary crisis started during the reign of the emperor Elagabalus. The value of both the denarius and the antoninianus could have dropped during his reign in opposition to the aureus. Elagabalus denarii have an average weight of 3.12g and his antoniniani 4.92g with an average fineness of 42% and 43% respectively (see tables 1 and 2). The street value of his denarii and antoniniani could have dropped to 30 and 15 to the aureus but again there is no hard evidence for this. That gold coins were better appreciated during this time period shows the example of Sennius Sollemnis in 220 AD.

¹ C.G.J. Pannekeet, Vier euwen keizers/munten, Slootdorp 1998.

² Cassius Dio 55, 12. The English translation of Cassius Dio's Roman history can be found at: http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Cassius_Dio/home.html

³ Gresham's law is named after Sir Thomas Gresham (1519 – 1579), a British financier. He stated that if a state or a ruler introduced bad money (debased or overvalued) next to good money (of high fineness and weight) the bad money would drive the good money out of circulation.

It was considered a great honour that he received his salary from Claudius Paulinus, the governor of Britain, in the form of gold coins (Devijver 2001). But then it seems that payment in gold always had been more prestigious than payment in silver or bronze coins (Verboven 2009). It appears that after the murder of Elagabalus his successor Severus Alexander reacted on something that was going on concerning the monetary system and conducted some sort of monetary reform. The only change in the monetary system is that under his reign the coinage of the antoninianus was discontinued. His denarii are no better than the denarii of Elagabalus. They have the same average weight, ca. 3.13g with the same average fineness of 42% (see table 1). After discontinuing the antoninianus he probably re-instated the denarius at his old value of 25 to the aureus. To commemorate this 'reform' two types of dupondii were struck, one with the legend RESTITVTOR MON(eta) and the other with the legend MON(eta) RESTITVTVA (RIC 589 and 601).



Severus Alexander as restorer of the monetary system, dupondius 16.97g.

Aelius Lampridius wrote that under his government the taxes were drastically lowered. People who had been forced to pay up to 10 aurei now had to pay only $\frac{1}{3}$ of an aureus.⁴ According to this writer Alexander also wanted to make it possible for the people to pay their taxes in gold coins. He supposedly ordered to mint coins with a value of $\frac{1}{3}$ and even $\frac{1}{4}$ of an aureus but there is no evidence these coins ever existed. It seems that gold coins of a lighter weight started to appear for the first time in the reigns of the emperors Gordian, Philip and Traian Decius. And sometime later in the reign of the emperor Valerian and his son Gallienus the triens Saloninianus ($\frac{1}{3}$ aureus) was introduced together with $\frac{1}{2}$ and $\frac{2}{3}$ aurei.



Triens Saloninus, 2.23g.

If there is some truth in the story of Aelius Lampridius it could indicate that despite of Alexander's so called reform there continued to be a monetary crisis. It seems that the government tried to collect the taxes in gold coins instead of debased silver coins. The debased denarii minted from the reign of Septimius Severus on could probably not maintain their forced value of 25 to the aureus and they started to devaluate again while the better denarii from before the debasement were probably being hoarded. There is only circumstantial evidence that a change in value must have already occurred prior to the reign of Philip the Arab (see later) and it could well have been in the reign of Severus Alexander.

⁴ Aelius Lampridius supposedly was one of the authors of the Historia Augusta. He wrote the part about the life of Severus Alexander. The part concerning the taxes is mentioned in paragraph 257.

Table 1 shows the fineness and the weight of silver denarii since the reign of the emperor Septimius Severus until the reign of the emperor Gordian III. A table like this is also published by Harl (1996). The results for the denarii from Antoninus Pius to Septimius Severus are from Butcher & Ponting (2012). The result for the later reigns are from Walker (1978) with a 10% downwards correction as suggested by Gitler and Ponting (2003).

Table 1: The fineness and silver content of the denarius since Antoninus Pius.

Period:	Ruler:	Coin:	Weight:	Fineness:	Silver:
Before 156	Antoninus Pius	Denarius	3.21	0.800	2.568
After 156	Antoninus Pius	Denarius	3.21	0.700	2.247
161-180	Marcus Aurelius	Denarius	3.25	0.700	2.275
180-192	Commodus	Denarius	3.07	0.680	2.088
193	Pertinax	Denarius	3.16	0.680	2.149
193	Didius Julianus	Denarius	2.95	0.680	2.006
193-194	Septimius Severus	Denarius	3.14	0.680	2.135
After 194	Septimius Severus	Denarius	3.22	0.460	1.481
211-217	Caracalla	Denarius	3.23	0.460	1.486
217-218	Macrinus	Denarius	3.15	0.521	1.641
219	Elagabalus	Denarius	3.12	0.418	1.304
222-228	Severus Alexander	Denarius	3.13	0.418	1.308
236-238	Maximinus	Denarius	3.07	0.414	1.271
238	Gordianus I&II	Denarius	2.97	0.565	1.678
238	Pupienus & Balbinus	Denarius	2.96	0.495	1.465
241	Gordianus III	Denarius	3.14	0.433	1.359

In the reign of Maximinus, Alexander's successor, no antoniniani were struck and neither in the short reign of Gordian I and II. It is not until the reign of the two senatorial emperors Pupienus and Balbinus (238 AD) that the antoninianus made a comeback. Probably to generate money after the disastrous government of Maximinus with a policy of high taxes and a pay raise for the soldiers from 900 denarii to 1800 denarii per year (Campbell 2006 p.20). After the reintroduction of the antoninianus the gold/silver ratio between the aureus and the antoninianus was less than the gold/silver ratio between the aureus and the denarius, see table 2. So it became more profitable to pay with overvalued antoniniani than with 'good' denarii. The latter coin started to disappear from circulation through hoarding and probably they were also melted down. The few older denarii from the 1st century and the denarii from the 2nd century probably already had disappeared from circulation because of their higher silver content. If they were turning up in payments they surely must have been exchanged against a higher value than the debased denarii from the 3rd century. During the reign of the emperor Gordian III (238-244) the antoninianus was struck in huge amounts and even nowadays they are still common and easy to find. In his reign and in the reign of his successor Philip the Arab the silver content of the antoninianus started to drop. This drop in fineness must eventually have affected the exchange value of the denarius and the antoninianus, see table 2.

An inscription from Nubia dated from the time of the emperor Philip the Arab (244-249) states that an aureus at that time had an exchange value of 40 denarii (20 antoniniani).⁵ This drop in value also must have started to affect the value of the denarius and the antoninianus expressed in sestertii. At first the antoninianus was valued at 8 sestertii but in the reigns of Gordian and Philip the value of the debased antoniniani must eventually have dropped to about 5 sestertii.



*Antoninianus van Gordianus,
3,70 gram.*

*Antoninianus van Philippus,
3,77 gram.*

Table 2 shows the fineness of denarii and antoniniani from the reign of Macrinus to Philip the Arab. The results are from Walker (1978) with a 10% downwards correction as suggested by Gitler and Ponting (2003) due to the method of analysis he had used. The table also shows the real gold/silver ratio with an aureus of 6.549g and 98% pure valued at 25 denarii or 12½ antoniniani. It seems that an acceptable bottom level for the gold/silver ratio was 1:5.5. Next to this the theoretical silver/brass ratio is given together with the real silver/brass ratio calculated from the average weight of sestertii. It seems that a silver content of 0.36g was accepted as the bottom level for the equivalent of one sestertius.

Table 2: The decline from the reign of Macrinus through Philip the Arab

	Silver content of the denarius	Ratio gold/silver	Silver content of the antoninianus	Ratio gold/silver	Ratio silver/brass theoretic	Ratio silver/Brass real	Value of the antoninianus in sestertii	Average weight of the sestertius
Macrinus	1.64	1:6.4	?	?	1:61	1:52	8	21.41
Elagabalus	1.30	1:5.1	2.12	1:4.1	1:77	1:71	8	23.01
Severus Alexander	1.31	1:5.1	-	-	1:77	1:62	8	20.82
Maximinus	1.27	1:4.9	-	-	1:79	1:64	8	20.74
Pupienus and Balbinus	1.47	1:5.7	2.37	1:4.5	1:69	1:55	8	20.22
Gordian III	1.36	1:5.3	1.90	1:5.8	1:74	1:59	5	19.90
Philip	?	?	1.75	1:5.3	1:72	1:53	5	18.70

What follows now are two examples of how the values from table 2 were obtained. On a certain point in time Severus Alexander's denarii appear to have contained ca. 1.31g of pure silver. The aureus was ca. 98% pure and struck at an official weight of 6.549g and was valued at 25 denarii. So the real gold/silver ratio is $25 \times 1.31g / 6.418g = 1:5.1$. During his reign no antoniniani were struck.

⁵ The inscription is mentioned by Bolin (1958) and Postan (1966). They refer to an inscription from Kardassi, Nubia.

The official weight of the sestertius was probably lowered in the reign of Caracalla to 1/13 pound (25.188g)⁶. Because one denarius was valued at four sestertii the value of one sestertius was the equivalent of approximately 0.33g of silver. The theoretical silver/brass ratio should end up at $25.188\text{g} / 0.3275 = 1:77$. This ratio is too high to mint sestertii on a profitable basis of 13 to the pound. The market value of brass was valued at a ratio of 1:62.5 with the silver. However the average weight of 62 of his sestertii turns out to be 20.82g. At this weight the real ratio is 1:62 so it became more profitable to mint sestertii. Probably the amount of zinc in the alloy was also lowered so the ratio became even more favourable.

Next a calculation with the antoniniani struck in the reign of the emperor Philip the Arab. On a certain point in time his antoniniani appear to contain ca. 1.75g of pure silver. An antoninianus in my opinion was a double denarius piece so officially the coin was valued at 12½ pieces to the gold aureus of 6.549g. However with a silver content of only 1.75g the gold/silver ratio comes out at 1:3.4 which is exceptionally low. The value of one antoninianus stated in sestertii should officially be eight so with this ratio an amount of 0.219g of pure silver was the equivalent of 1 sestertius. With these values the theoretical silver/brass ratio ends up at 1:115, too high to mint sestertii profitable. The average weight of 82 of his sestertii turns out to be 18.70g. This makes the real ratio come to 1:85 which is still too high. Because the inscription from Nubia states that in his reign the aureus equalled 40 denarii and thus 20 antoniniani a correction has to be made. In his reign the aureus was no longer worth 12½ antoniniani but 20. With this value the real gold/silver ratio can be calculated at $20 \times 1.75\text{g} / 6.549\text{g} = 1:5.3$. The value of an aureus was still expressed in 100 sestertii so the value of one antoninianus ends up at 5 sestertii. With these figures an amount of 0.35g of silver was the equivalent of one sestertius. The theoretical silver/brass ratio ends up at $25.188\text{g} / 0.35 = 1:72$ and the real ratio at 1:53. Looking at these figures it appears that the market made corrections when it came out that the gold/silver ratio got below 1:5 and the value of the sestertius expressed in an certain amount of silver got below ca. 0.325g.

⁶ Pannekeet, CGJ, A personal view on the introduction of a new coin in the reign of the emperor Caracalla, Slootdorp 2013.

Table 3 shows analyses as they were found by Le Gentilhomme (1962). The analysis of an antoninianus struck in the reign of the emperors Pupienus/Balbinus is from a list published by Harl (1996). The values in the grey cells are the averages from a greater amount of analyses.

Table 3: Analyses of antoniniani from the reign of the emperor Caracalla to Volusian.

Period:	Emperor:	Type:	Coin:	Weight:	Fineness:	Gr. silver:	
215-217	Caracalla	RIC 256	Antoninianus	3.630	.487	1.77	
215-217	Caracalla	RIC 259	Antoninianus	4.830	.616	2.98	
215-217	Caracalla	RIC 263	Antoninianus	5.085	.501	2.55	
215-217	Caracalla	RIC 264	Antoninianus	4.980	.467	2.33	
215-217	Caracalla	RIC 273	Antoninianus	4.555	.475	2.16	
215-217	Caracalla	RIC 277	Antoninianus	3.600	.667	2.40	
215-217	Caracalla	RIC 293	Antoninianus	3.190	.480	1.53	
215-217	Caracalla	RIC 311	Antoninianus	5.230	.478	2.50	
215-217	Caracalla	RIC 312	Antoninianus	4.615	.437	2.02	
				Gemiddeld:	4.413	.512	2.25
218-222	Elagabalus	RIC 22	Antoninianus	4.425	.510	2.26	
218-222	Elagabalus	RIC 72	Antoninianus	5.590	.433	2.42	
218-222	Elagabalus	RIC 129	Antoninianus	4.810	.453	2.18	
218-222	Elagabalus	RIC 1	Antoninianus	5.080	.430	2.18	
218-222	Elagabalus	RIC 122	Antoninianus	4.905	.401	1.97	
218-222	Elagabalus	RIC 155	Antoninianus	4.720	.371	1.75	
				Gemiddeld:	4.921	.433	2.12
238*	Pupienus/ Balbinus	RIC ?	Antoninianus	4.790	.496	2.37	
238-239	Gordian III	RIC 1-39	Antoninianus Rome	4.405	.426	1.88	
239-240	Gordian III	RIC 51-56	Antoninianus Rome	4.178	.444	1.86	
240-244	Gordian III	RIC 65-156	Antoninianus Rome	4.550	.385	1.75	
239-240	Gordian III	RIC 172-202	Antoninianus Antioch	4.016	.455	1.83	
242-245	Gordian III	RIC 206-216	Antoninianus Antioch	4.957	.436	2.16	
245-246	Philip I	RIC 2-4	Antoninianus Rome	4.202	.427	1.79	

Period:	Emperor:	Type:	Coin:	Weight:	Fineness:	Gr. silver:
245	Otacia Severa	RIC 115	Antoninianus Rome	3.975	.444	1.77
246-247	Philip I	RIC 73-74	Antoninianus Antioch	3.763	.372	1.40
247-248	Philip II	RIC 240	Antoninianus Antioch	3.933	.315	1.24
247-248	Otacia Severa	RIC 133	Antoninianus Antioch	4.570	.280	1.30
247-248	Philip I	RIC 7-25	Antoninianus Rome	4.032	.389	1.57
246-248	Philip II	RIC 223-224	Antoninianus Rome	3.710	.303	1.12
247-249	Philip I	RIC 57-65	Antoninianus Rome	4.291	.406	1.74
249	Philip I	RIC 26-53	Antoninianus Rome	4.063	.394	1.60
249	Traian Decius	RIC 2-6	Antoninianus Rome	4.045	.408	1.65
249-251	Traian Decius	RIC 10-29	Antoninianus Rome	4.168	.419	1.75
250-251	Traian Decius	RIC 37-38	Antoninianus Rome	3.623	.398	1.44
250-251	Traian Decius	RIC 85-90	Antoninianus Rome	3.235	.380	1.23
251	Traian Decius	RIC 44-46	Antoninianus Antioch	4.013	.263	1.06
251-252	Trebonianus Gallus	RIC 30-48	Antoninianus Rome	3.314	.309	1.03
251-252	Trebonianus Gallus	RIC 69-72	Antoninianus Milan	3.461	.379	1.31
252-253	Trebonianus Gallus	RIC 79-91	Antoninianus Antioch	3.630	.189	0.69
253	Volusian	RIC 141-187	Antoninianus Rome	3.473	.348	1.21
251-253	Volusian	RIC 205-206	Antoninianus Milan	3.788	.377	1.43
252-253	Volusian	RIC 221	Antoninianus Antioch	3.460	.192	0.66

Caley and McBride (1956) also did some research on the silver content of the antoniniani. They analysed antoniniani struck in the reigns of Traian Decius, Trebonianus Gallus and Valerian to discover where exactly the rapid debasement of the antoninianus had begun. These results can be seen in table 4 and are comparable with the analyses of Le Gentilhomme (1962). The only discrepancy is with the antoniniani from the reign of the emperor Valerian. Apparently they analysed some late specimens with a lower silver content.

Table 4: Analyses of antoniniani from the reigns of the emperors Traian Decius, Trebonianus Gallus and Valerian.

Munt	Ag %	Au %	Cu %	Sn %	Pb %	Fe %	Ni %	Zn %	Total
Traian Decius	42.21	0.33	56.18	0.11	0.43	0.08	0.08	0.11	99.53
Traian Decius	39.53	0.30	59.02	0.43	0.48	0.16	0.04	0.09	100.05
Traian Decius	38.33	0.27	59.00	1.40	0.64	0.11	0.04	0.11	99.90
Traian Decius	21.52	0.71	74.93	1.45	1.05	0.05	0.04	0.51	100.26
Trebonianus Gallus	36.80	0.17	61.31	0.65	0.50	0.10	0.03	0.05	99.61
Trebonianus Gallus	35.28	0.48	61.83	1.25	0.80	0.05	0.06	0.08	99.83
Trebonianus Gallus	29.96	0.22	65.94	2.63	1.07	0.03	0.05	0.09	99.99
Trebonianus Gallus	23.76	0.19	73.87	0.74	0.72	0.10	0.06	0.49	99.93
Valerian	24.44	0.24	73.44	0.78	0.75	0.08	0.07	0.08	99.88
Valerian	17.32	0.16	79.87	1.63	0.91	0.07	0.06	0.05	100.07
Valerian	15.10	0.15	80.87	2.74	1.02	0.13	0.06	0.04	100.11
Valerian	14.92	0.14	83.60	0.18	0.55	0.31	0.05	0.09	99.99

The analyses of Le Gentilhomme and Caley & McBride show that with every new ruler the silver content is getting lower. The silver content also seems to behave erratically within the reign of the same ruler. This can be caused by poor quality control or the alloy was just getting worse during the reign. In that case the analyses of coins could help in dating coins without any clues of when they were struck in the reign of a certain emperor. Coins with a lower fineness could for instance belong to a later date in the reign of the emperor. Just as the rule of thumb that coins with long imperial titles belong early in the reign of an emperor and the coins with little titles and short, abbreviated legends belong to a date later in the reign. The table shows that the fineness of antoniniani struck in the reigns of Traian Decius and Trebonianus Gallus begins to drop. It looks like the decline of the antoninianus started from the year 250/251. From the percentages of other metals in the alloy Caley & McBride drew the following conclusions. The percentage of gold in these antoniniani is relatively high for silver coins. They blame it on the copper used in the alloy, copper contains traces of gold but it is also possible that scrap copper with traces of gold foil was used. According to them the percentages of tin, lead, zinc and nickel also points to the use of raw copper. The percentage of nickel for instance is very stable and was present in the raw copper.

Table 5: The coins used by Caley & McBride with their weight and fineness.

Periode	Muntheer	Type	Gewicht	Gehalte	Gr. Zilver
249-251	Trajanus Decius	Antoninianus	3.64	.395	1.44
249-251	Trajanus Decius	Antoninianus	3.61	.422	1.52
249-251	Trajanus Decius	Antoninianus	3.46	.383	1.33
249-251	Trajanus Decius	Antoninianus	3.12	.215	0.67
Gemiddeld			3.46	.354	1.24
251-253	Trebonianus Gallus	Antoninianus	3.86	.238	0.92
251-253	Trebonianus Gallus	Antoninianus	3.34	.368	1.23
251-253	Trebonianus Gallus	Antoninianus	2.79	.300	0.84
251-253	Trebonianus Gallus	Antoninianus	3.18	.353	1.12
Gemiddeld			3.29	.315	1.03
253-260	Valerianus	Antoninianus	3.48	.244	0.85
253-260	Valerianus	Antoninianus	3.42	.173	0.59
253-260	Valerianus	Antoninianus	3.85	.149	0.57
253-260	Valerianus	Antoninianus	2.68	.151	0.40
Gemiddeld			3.36	.179	0.60

During the reign of Traian Decius his antoniniani must have devaluated from 20 to 25 pieces to the aureus of 6.549g. Now the antoninianus had reached the same value as the denarius and its exchange value now equalled 4 sestertii. This is probably the reason why double sestertii started to appear in the reign of Traian Decius and why older denarii were restruck with Antoninianus dies. The very few aurei I could find from his reign have an average weight of 4.215g. They appear to be $\frac{2}{3}$ aurei and they could have been an attempt to give his own antoniniani an exchange rate of $12\frac{1}{2}$ to this new aureus. During the turbulent reigns of Trebonianus Gallus and Aemilian the debasement of the antoninianus continued. Because of this debased character the exchange value should have dropped from 25 to ca. $33\frac{1}{3}$ to the aureus of 6.549g giving the coin a value of about 3 sestertii. This devaluation probably not happened before ca. 255/256 in the reign of the emperors Valerian and Gallienus. Around this time period the silver content of the antoninianus had dropped to ca. 1.00g. Table 6 shows known analyses of antoniniani struck in the reigns of Aemilian to Quintillus. These results come from the analyses of Le Gentilhomme (1962). The analyses of antoniniani struck in the reigns of Claudius and Quintillus and of those struck in the mint of Milan in the name of Postumus are from a table published by Harl (1996). The numbers in the grey cells are averages out of a much larger number of analyses.

Table 6: Analyses of antoniniani of Aemilian to Gallienus as sole ruler.

Period:	Emperor:	Type:	Coin:	Weight:	Fineness:	Silver (gr):
253	Aemilian	RIC 1-12	Antoninianus Rome	3.688	.379	1.40
253	Aemilian	RIC 14-22	Antoninianus Rome	3.278	.329	1.08
253-254	Valerian	RIC 71-141	Antoninianus Rome	3.720	.363	1.35
253-254	Gallienus	RIC 115-181	Antoninianus Rome	3.671	.359	1.32
253-255	Valerian	RIC 271-257	Antoninianus Viminacium	3.697	.336	1.24
253-255	Gallienus	RIC 377-403	Antoninianus Viminacium	3.321	.365	1.21
255-256	Valerian	RIC 240-264	Antoninianus Viminacium	3.228	.292	0.94
255-256	Gallienus	RIC 404	Antoninianus Viminacium	2.710	.317	0.85
256	Valerian	Elmer 1-9	Antoninianus Cologne	3.072	.418	1.28
256-257	Gallienus	Elmer 18-31	Antoninianus Cologne	3.740	.398	1.49
257-258	Gallienus	RIC 157-186	Antoninianus Rome	3.159	.315	1.00
257-258	Gallienus	Elmer 40-46	Antoninianus Cologne	3.445	.406	1.40
258-259	Gallienus	RIC 380-405	Antoninianus Milan	3.287	.189	0.62
258-259	Gallienus	RIC 157-186	Antoninianus Rome	3.258	.168	0.55
255-259	Valerian	RIC 69-142	Antoninianus Rome	2.926	.185	0.54
256-258	Valerian	RIC 214-277	Antoninianus Antioch	3.501	.163	0.57
257-258	Gallienus	RIC 442	Antoninianus Antioch	3.380	.175	0.59
257-258	Valerian	RIC 284-295	Antoninianus Samosata	3.716	.160	0.59
257-258	Gallienus	RIC 447-456	Antoninianus Samosata	3.850	.159	0.61
257-259	Valerian	Elmer 16-76	Antoninianus Cologne	3.371	.317	1.07
258-259	Gallienus	Elmer 54-88	Antoninianus Cologne	3.664	.341	1.25

Period:	Emperor:	Type:	Coin:	Weight:	Fineness:	Silver (gr):
260	Macrianus/Quietus	RIC 8-11	Antoninianus Antioch	3.495	.142	0.50
259-264	Gallienus	RIC 157-334	Antoninianus Rome	3.513	.129	0.45
259-263	Gallienus	RIC 315-501	Antoninianus Milan	2.865	.159	0.46
263-264	Gallienus	RIC 474-507	Antoninianus Milan	3.379	.087	0.29
264-267	Gallienus	RIC 157-334	Antoninianus Rome	3.024	.058	0.18
264-267	Gallienus	RIC 471-513	Antoninianus Milan	3.098	.061	0.19
267-268	Gallienus	RIC 556-580	Antoninianus Siscia	3.378	.050	0.17
268	Postumus*	?	Antoninianus Milan	2.690	.056	0.15
268	Gallienus	RIC 157-334	Antoninianus Rome	3.251	.023	0.075
268-270	Claudius*	?	Antoninianus	2.980	.026	0.077
270	Quintillus*	?	Antoninianus	2.500	.026	0.065

All tables show that the greatest debasements occurred during the reign of the emperors Valerian and Gallienus with a rapid decline in fineness during the last years of the sole reign of the emperor Gallienus. In the joint reign of the emperors Valerian and Gallienus a debasement took place around the year 256. When the new intrinsic value of these debased coins became known the exchange value of these new debased antoniniani must have sunk from 25 to $33\frac{1}{3}$ to the aureus of 6.549g giving them a value of three sestertii. It probably also caused hoarding and the melting down of the older coins. Sestertii were still struck but in much smaller quantities than in the previous reigns. The weight of the gold coins became very erratic, it seems they aimed at striking $\frac{1}{3}$, $\frac{1}{2}$, and $\frac{2}{3}$ aurei together with some rare full aurei and multiples. These coins must have found their place in the money system either at face value or by weighing them. Over the years 258-260 the emperor Gallienus faced various revolts and usurpations in the west while his father was campaigning against the Persians in the east. During this time there was another debasement of the antoninianus in which its silver content dropped to ca. 0.60g. The value of these new debased coins could have dropped from $33\frac{1}{3}$ to 50 to the aureus of 6.549g with a value expressed in sestertii of two.

In the sole rule of the emperor Gallienus there were several debasements which eventually must have affected the value of the antoninianus even further. Over the period 259-264 the value could have sunk from 50 to $66\frac{2}{3}$ to the aureus, over the period 264-265 from $66\frac{2}{3}$ to 100 to the aureus and eventually over the period 265-267 from 100 to 200 to the aureus of 6.549g. The value expressed in sestertii devaluated from $1\frac{1}{2}$ to 1 and eventually to $\frac{1}{2}$ sestertius. Eventually the coinage of sestertii came to a halt. The ones that were still circulating had become superior in value in opposition to the debased antoniniani. The peak of the debasement occurred after the fall of Gallienus during the reigns of his successors Claudius, Quintillus and Aurelian. The antoniniani struck during their reigns must have devaluated to 500 to the aureus of 6.549g with a value of only $\frac{1}{5}$ sestertius.

Looking at the numbers in the tables the market could have reacted on the value of the antoninianus when the ratio gold/silver had sunk under 1:5. An overview of the debasement and possible devaluation is shown in table 7.

Table 7: The probable debasement and devaluation of the antoninianus from the reign of Traian Decius trough Quintillus.

	Grams of silver in the antoninianus	Ratio gold/silver	Ratio silver/brass theoretical	The real ratio silver/brass	Sestertii in one antoninianus	Real average weight of sestertii
Traian Decius	1.43	1:5.5	1:71	1:48	4	17.25
Trebonianus Gallus	1.17	1:4.5	1:86	1:60	4	17.58
Aemilian	1.24	1:4.7	1:81	1:59	4	18.42
Valerian & Gallienus 253-256	1.28	1:4.9	1:79	1:57	4	18.22
Valerian & Gallienus 256-258	0.95	1:4.8	1:80	1:58	3	18.22
Valerian & Gallienus 258-259	0.60	1:4.6	1:84	1:61	2	18.22
Gallienus sole reign 259-264	0.46	1:4.7	1:82	?	1½	16.91
Gallienus sole reign 264-265	0.32	1:4.9	1:79	?	1	?
Gallienus sole reign 265-267	0.17	1:5.2	1:74	?	1/2	?
Gallienus sole reign 268	0.075	1:5.7	1:67	?	1/5	?
Claudius/Quintillus	0.071	1:5.4	1:71	?	1/5	?

Coin hoards hidden over the years 260-269 seem to show that the antoniniani struck during the joint reign of the emperors Valerian and Gallienus still mixed among the antoniniani of better fineness struck in the reigns of their predecessors.⁷ Because they show up together it is not clear if there might have been a different valuation among them. It seems however inevitable that after every (secret?) debasement the real value of the new coins sooner or later came to light. The public must eventually have reacted in accepting them at a lower price opposite to the older ones. An important role in the valuation of coins must have been played by the bankers and money changers. Trough them the real value of new debased coins became known because it seems only logical that they did not want to accept the new debased coins at the same face value as the older ones. Coin hoards hidden after Aurelians monetary reform seem to show a certain shift in the circulation. The bulk of the coins start to consist out of specimens struck after 253 with only very small numbers of early antoniniani from the reign of Valerian and Gallienus.⁸

⁷ L'écluse de Creil (Frankrijk): 988 antoniniani from Julia Domna to Postumus, Chilleursau-bois (Loiret Frankrijk): 150 antoniniani from Traianus Decius to Postumus.

⁸ Unknown location, hidden ca. 302/303 possibly in the vicinity of Lyons: 949 antoniniani, 5 denarii and 425 folles with only one antoninianus struck in the reign of Valerian, the rest of the coins are from a later date. Çanakkale (Turkey) hidden ca. 284: 3029 antoniniani, 14 denarii and one provincial bronze coin, the oldest coins date from the 7th consulat of Gallienus. Francavilla Fontana (Italy), hidden ca. 310/313: 168 coins (folles and antoniniani) the oldest coins are struck in the reign of Gallienus. Thibouville (France), hidden ca. 294: 3256 coins (folles and antoniniani): only one coin from the reign of Trebonianus Gallus and one coin of Valerian. Laville dieu (France), hidden in the reign of Aurelian: 298 antoniniani of wich only two from the reign of Valerian. Montereau (France), hidden ca. 293/294: 338

Late third century coin hoards show that the denarii struck before the reign of the emperor Nero had completely disappeared. The denarii from Nero to the beginning of the reign of Septimius Severus seem to be hoarded separately from those struck during the third century. The antoniniani are separated between those with a reasonable silver content and those with lower silver content or silvering as struck from the reign of Valerian and his successors. It is highly probable that certain types of antoniniani struck by certain rulers each had their own valuation. Unfortunately no epigraphic evidence has come to light about this subject but the valuation could have followed the course as described in this article. It seems only logical that the old denarii struck in the reigns of Nero to Septimius Severus kept their value of 25 to the aureus and over time became known under the name argenteus. The debased denarii struck in the reign of Septimius Severus and the debased denarii of his successors kept the name denarius. When the argentei and denarii were driven out of circulation by the antoninianus the term denarius transformed into a unit of account with the name denarius communis.

As mentioned previously in my article about the introduction of the antoninianus the *Historia Augusta* mentions some payments of military salaries and allowances.⁹ In the reign of the emperor Valerian the salary of a military tribune appears to have been 25000 sestertii.¹⁰ The sestertius stayed in use as a unit of account and the amount of 100 sestertii was still the equivalent of one gold aureus. So the amount of 25000 sestertii was the equivalent of 250 gold aurei. The coins in which the payment was carried out was as follows: 100 aurei antoniniani, 1000 argentei Aureliani and 10000 aerei Philippei. Another general of Valerian received a payment of 300 aurei antoniniani, 3000 argentei Philippei minutuli and in aere HS quinquagies to cover the costs of circus games.¹¹ Yet another general received an allowance of two aurei antoniniani, 50 argentei Philippei minutuli, and aeris denarii centum on an inspection trip.¹² The last example is a general who received an amount of money in the reign of Aurelian in the form of 100 aurei Philippi, 1000 argentei antoniniani and aeris HS decies.¹³

If we look a little closer at the 25000 sestertii which Probus earned as a tribune under Valerian it appears that he received 100 gold aurei representing a value of 10000 sestertii. Next to that he received 10000 sestertii (10000 aerei Philippei) what brings the total up to 20000 sestertii. This still leaves 5000 sestertii which he received in the form of 1000 argentei aureliani. So this amount of money was the equivalent of 5000 sestertii or 50 aurei. If these coins should have been 'good' denarii this would mean a number of 1250 pieces and if they would have been 'good' antoniniani with an original value of two denarii this would have meant a number of only 625 pieces. He received however the number of 1000 antoniniani so here we find some evidence that the antoninianus had devaluated to five sestertii. These specimens could have been struck in the reigns of Gordian and Philip because the antoniniani struck in the reigns of Traian Decius, Trebonianus Gallus and Valerian himself were too debased for this exchange rate. The account shows further that one aureus still had a value of 100 sestertii. The payment expressed in 10000 sestertii could have been in actual brass sestertii because these coins were still struck and were still circulating during that time. The sestertii also had become more trustworthy coins in opposition to the very debased antoniniani.

antoniniani with only two from the reign of Valerian. Cunetio (England), hidden ca. 275: 99% of the coins are from the period after 253. Normanby (England): coins from the reigns of Valerian to Carausius with one plated denarius from the reign of Septimius Severus present.

⁹ Pannekeet, CGJ, A personal view on the introduction of a new coin in the reign of the emperor Caracalla, Sloodorp 2013.

¹⁰ *Historia Augusta*, vita Probus IV.

¹¹ *Historia Augusta*, vita Aurelianus XII.

¹² *Historia Augusta*, vita Aurelianus IX.

¹³ *Historia Augusta*, vita Bonosus XV.

Conclusion

The reintroduction of the antoninianus by the emperors Pupienus and Balbinus eventually resulted in the disappearance of the denarius because this coin was of slightly better fineness in contrary to the antoninianus. The instable situation in the empire with (civil) wars and usurpers made that the antoninianus became more and more debased causing the coin to drop in value and causing inflation. The denarius became debased also but remained of slightly better quality than the antoninianus causing the coin to be hoarded, melted down and eventually he disappeared from circulation. The name denarius became a unit of account, the denarius communis. The older denarii of good quality silver became known as argenteus. Looking at how debased the denarius and antoninianus had become in opposition to the aureus and the copper coins their value must have dropped accordingly. As stated above the aureus eventually must have had a value of 500 antoniniani. A source from Palestine, the Talmud dating from around 265-275, states that an aureus was valued at 1000 denarii (Sperber 1974). This amount equals 500 antoniniani. The devaluation of the antoninianus created a gap between this coin and the silver argentei (the old denarii) and the gold aureus. It is therefore understandable that the sestertii and asses were kept into circulation to fill this gap and it explains why they continued to be struck in large amounts in the Gallic empire during the reign of the emperor Postumus. These coins were no longer subdivisions of the antoninianus but became coins of superior value contrary to the antoninianus, they even turn up in coin hoards.¹⁴ To further close the gap some lightweight gold coins started to appear. In the reign of the emperor Valerian subdivisions like the triens Saloninianus ($\frac{1}{3}$ aureus), half aurei and the aureus Valerianus (the double triens or $\frac{2}{3}$ aureus of Valerian). The coins became known under the name of the person who emitted them first or whose image was depicted on them. As stated earlier the name Philippeus seems to have been used for all the older sorts of gold, silver and copper coins. According to the Historia Augusta the emperor Valerian mentioned sums of money by name. There is mention of aurei Philippei nostri vultus, gold coins with our image but also of argentei Philippei minutuli, silver denarii and aerei Philippei, copper coins. Maybe these names had come into use to describe coins minted on the foot used from the time of the emperor Caracalla until the reign of the emperor Philip the Arab.

An Egyptian papyrus dated 24 november 260 shows how much strain there must have been on the coin circulation.¹⁵ The strategos (governor of a district) Aurelius Ptolemaeus had to force the bankers and traders to accept all valid currency. They probably feared to lose money if they had to accept the debased coins of Gallienus or the coins of the usurpers Macrinus and Quietus. These last two were elevated to the rank of Augustus by the armies in the east after the emperor Valerian was captured by Shapur of Persia. They probably were afraid that the coins could be demonetised by the emperor Gallienus. Examples like this give reason to suspect that this probably happened more often and the trust in the coinage was under a lot of strain in those days.

¹⁴ Guiscard (France): one sestertius from the reign of Hadrian and 15 bronzes from the reign of Postumus of which some are imitations. Nery (France): 140 bronzes from the reign of Vespasian to Postumus (asses, dupondii and sestertii). Angicourt (France): 5400 bronzes from the reign of Galba to Postumus. Chevincourt (France): 35 bronzes from the reign of Nero to Postumus. Elincourt-Saint-Marguerite (France): 400 bronzes from the reign of Traian to Postumus. Muirancourt (France): 90 bronzes from the reign of Traian to Postumus. Vannes (France): 651 coins with bronzes from the reign of Galba to Postumus. Chilleurs-au-Bois (France), multiple coin hoards were found in this region, one of them contained 647 bronzes from the reign of Traian to Postumus. In this hoard there were also three bronze ingots present together with 500 bronzes from the reign of Antoninus Pius to Caracalla and late antoniniani until the reign of Claudius II.

¹⁵ P.Oxy XII, 1411 - Bogaert (1994) 109-112.

Literature

Caley, E.R., McBride, H.D. Chemical composition of antoniniani of Trajan Decius, Trebonianus Gallus and Valerian. Department of Chemistry Ohio State University (Columbus 10 1956).

Campbell Brian, The Roman Army, 31 BC–AD 337 A Sourcebook, Routledge 1994/2006 p.20.

Devijver, H. Prosopographia militiarum equestrum quae fuerunt ab Augusto ad Gallienum, CIL 13, 3162. cf. (Leuven 1976-2001) II 729-730, IV 1718.

Gentilhomme, Le G. Variations du titre de l'antoninianus au IIIe siècle. Revue numismatique 6e série tome 4 (1962) 141-166.

Gitler, H., Ponting, M. The silver coinage of Septimius Severus and his Family (AD 193-211). Glax. vol 16 Ennerre (Milan 2003).

Harl, K.W. Coinage in the Roman economy 300 B.C. to A.D. 700 (1996).

Butcher, Kevin & Ponting, Michael Ponting, The Beginning of the End? The Denarius in the Second Century. The Numismatic Chronicle 172 - The royal numismatic society, London 2012.

Verboven, Koenraad Currency, bullion and accounts. Monetary modes in the Roman world. Belgisch Tijdschrift voor Numismatiek en Zegelkunde. 155 (2009) 91-121.

Walker, DR. The Metrology of the Roman Silver Coins (1978).