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Environment and Policies
in the Roman Empire
up to Diocletian's Price Edict**

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ABSTRACT

The paper deals with the origins of one of the earliest recorded inflations, which occurred in the Roman Empire. The received wisdom is that attested government deficits in the course of the first three centuries A.D., led to successive increases in the money supply, facilitated by continuous debasements of the silver currency, up to the reign of Diocletian (284-305). The latter attempted to restore trust to the coinage by issuing gold and silver coins of good quality. However, he also minted significant quantities of bronze coins in order to finance the restoration, reform, and preservation of the Empire. Thus, he further increased the money supply. According to extant records of wheat prices from Egypt, the above policies produced inflation, the average rate of which has been estimated, by certain economists to about 4-5% per annum. We follow the story up to Diocletian's attempt, in late 301, to set price-ceilings, and suggest that most of the explanations offered to rationalize the phenomenon are probably not only partial, but also not even the main explanations. The inflation rates are underestimated as well.

JEL classification codes: E31, N13.

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1. Introduction

The purpose of this paper is to study the issues associated with the continuous price increases that occurred in the Roman Empire at the end of the third century A.D. This ancient episode of economic history is cited in the *New Palgrave* as one of the earliest documented inflations, after which, and for about the next thousand years, our knowledge of such economic events, is non-existent.

Understandably, the phenomenon has attracted interest from the disciplines of History and Economics, especially since it has been considered as a reason for the decline of the monetary economy in late antiquity. Parkin (1987) describes the inflation as rapid, Bowman (1980) as massive, Tomlin (1980) and Starr (1982) as severe, and Duncan-Jones (1982) as staggering. However, in considering price data from A.D. 150-301, Paarlberg (1993) estimates the annual rate of inflation averaged about 5.6%; and Fisher et al. (2002, relying on Paarlberg) suggest that the rate was perhaps less than 4%, possibly 3.6%. In this paper, we re-examine the available evidence and the issues involved, and come to favour the view that the inflation rate was neither as modest nor as protracted, though the debasement period that preceded the inflation was, apparently, lengthy.

In considering the basic aspects of this kind of study, it seems that (a) the numismatic evidence is quite robust (on account of the archaeological discoveries and spectral analyses);¹ (b) the price evidence is less adequate (consisting of a rather small sample of recorded transactions preserved on Egyptian papyri and ostraca, as well as Diocletian's Price Edict); (c) the literary evidence pertaining to the State's fiscal conditions and monetary policies lacks continuity (though a number of issues have been inferred by modern historians);² and (d) the elements of economic theory employed, namely, *Gresham's Law* and the *Equation of Exchange*, are among the most robust that the discipline of Economics has to offer.

Naturally, the combined treatment of the above by a student of either discipline poses a challenge insofar as it requires expertise on issues normally studied in the

¹ See Frank (1936), Walbank (1951), Jones (1953; 1964), Tomlin (1980), Bagnall (1985), Hendy (1985), Sutherland (1992), Bland (1996), Harl (1996), Rathbone (1996), Volk (1996), and the sources mentioned therein. On the basis of the above we carry the discussion on currency content, fineness, and circulation, hereinafter.

² Indeed, the small body of circumstantial literary evidence provided by ancient authors such as Suetonius, Dion Cassius, and Herodian carries us to the early decades of the third century. Subsequently, the quality in the testimony of literary guides decreases, and the references to the state of the Roman Treasury eclipse.

other discipline. For instance, the historian runs the risk of missing economic links between events and making assumptions or offering explanations that in the economist's view are incompatible with or misrepresentative of economic thought.³ Similarly, the economist runs the risk of missing events and references (that are all too obvious to the historian) or simplistically combining scanty quantitative data from antiquity, and reaching awkward or misleading conclusions.⁴ The present treatment does not offer new data, and its aim is to offer a fresh perspective on the issue, especially since the impact of certain, fundamental, very obvious, economic elements, appear to have been missed in the literature. Indeed, considering that for most of the long debasement period (i.e., from the 60s to the 240s) price levels are reported to have risen very little (e.g., Harl, 1996), we ought to look for a good set of explanations in terms of developments in the other components of the *Equation of Exchange* (i.e., M , V , and T), before and during the inflationary spiral, instead of ascribing the price stability (or inflation) to the high (or low) level of public confidence created by the appearance and content of the coinage (e.g., Harl, 1996).

The rest of the paper is organised as follows: Section 2 introduces the elements of economic theory that are most relevant to our analysis. Section 3 provides the historical context. Section 4 discusses the fiscal and monetary practices of the Roman government in the first three centuries A.D. Section 5 estimates an inflation proxy from the extant prices of Egyptian wheat from the same period. Finally, Section 6 offers the summary and conclusions.

2. Elements of economic theory

To dispel any misconceptions we first clarify that the term *Gresham's Law* (mistakenly attributed to a statement made by Gresham in 1558) denotes the well-ascertained

³ For instance, in attempting to describe the operations in the *Equation of Exchange*, Hopkins (1980: 110) attributes a rise in the supply of money to a surge in the number of people using it for transactions, which in fact, describes (not a rise in the quantity of money but) perhaps a rise in the velocity of circulation. And Whittaker (1980: 4) employs the same equation as if it were a proper tool for explaining how a rise in the (monetary and non-monetary) supply of gold (not the total money supply, contra Whittaker, 1980: 2-3) would mirror a rise in the overall quantity of commodities produced, and vice-versa.

⁴ E.g., Paarlberg and Fisher et al., who, as mentioned above, traced an average inflation rate spanning a century and a half, perhaps on account of broad comparisons between wheat prices 150-years apart, made by Jones (1953), Duncan-Jones (1990), and others. However, historians have over the last decades consistently suggested -though not in terms of compound annual rates- that prices rose considerably within a much shorter period of time, spanning perhaps the last three quarters of a century or quarter of a century, e.g., Duncan-Jones (1982, 1990), Rathbone (1996).

principle that is often -though not adequately- expressed in the dictum “bad money drives out good money”. The phenomenon was probably recognized as early as 404 B.C. by Aristophanes (§718-33), while the issue was first discussed by Oresme (1360). In its complete form it may be stated as follows: When a government assigns the same nominal value to two or more forms of currency whose intrinsic values differ, payments will always (as far as possible) be made in the medium of which the cost of production is least, and the more valuable (finer) medium will either tend to disappear from circulation or (in case the amount in circulation is not sufficient to satisfy the demand for currency) run to a premium (Kindleberger, 1993; Harris, 1987). According to Galbraith (1975), *Gresham’s Law* stands as perhaps the only economic law that has never been challenged.

The *Equation of Exchange* (often referred to as the *Quantity Equation*) was first expressed by Locke (1691). Perhaps, its best known variant is the one provided by Fisher (1922): $MV = PT$, relating the circular flow of money in a given economy over a specified period of time to the circular flow of goods, where M is defined as the total quantity of money in the economy; V represents the velocity of circulation (in the form of the average number of times a unit of currency turns over in the course of affecting a year’s transactions); T is defined as the total physical volume of goods, services, and securities transacted for money; and P is the weighted average of prices of the items transacted in the economy. Consequently, its left-hand side stands for the money exchanged, and the right-hand side represents the goods, services and securities exchanged for money during the specified period of time. Obviously, although a building block of monetary and macroeconomic theory, the *Equation of Exchange*, is not in itself a theory, but an accounting identity for a monetary economy (e.g., Bordo, 1987).

The above two concepts are clearly separate and very robust on their own. Consequently, they ought not be confused or dismissed as some sort of modern theory or a collection of relationships and results pertaining to the highly monetized and industrialized economies, whose application in the Roman economy is perhaps questionable. Furthermore, with regard to *Gresham’s Law*, currency debasements do not necessarily require that (a) commodity prices have to increase or (b) all earlier and finer coins have to be withdrawn from circulation (so that their extra precious metal is extracted), for the principle to hold, as the reader of Rathbone (1996: 324-5,334,338) and Lo Cascio (1996: 283) may infer.

3. The historical background

The main historical developments pertaining to our study may be found in a number of specialised treatments dealing with the period under examination, for instance, Starr (1982). To ease the economist into the setting, we start by framing it in terms of an environment satisfying the assumptions of a simple macroeconomic model consisting of a monetised, largely self-sufficient, agricultural society,⁵ with a nearly unchanging technology,⁶ a non-growing population,⁷ and a labour force with comparatively little mobility (by modern standards) due to institutional factors.⁸

At that time, the Roman Empire stretched over the Mediterranean seaboard and a large part of southeastern and western Europe. Yet, unlike the relative tranquillity of the first and second centuries A.D., the State's eastern and northern frontiers faced serious external threats.⁹ The situation was compounded by internal political instabil-

⁵ The received wisdom is that: (a) The Roman Empire was a *nearly-autarkic economy*, where foreign trade (confined mainly to some luxury items) played a rather insignificant role in relation to the size of the economy, especially as the volume and impact of foreign trade were probably reduced in the second and third centuries A.D. (b) The greater part of the Empire's labor force (perhaps 80-90%) engaged in low-level agriculture, and households lived slightly above the minimum level of subsistence, while industry depended by and large on a rather backward (by modern standards) technology. (c) The use of money, though well attested in the cities, is believed to have been less pervasive in the countryside, where the velocity of circulation was perhaps lower. See also Jones (1953, 1964), Hopkins (1980), Duncan-Jones (1982), Harl (1996).

⁶ It appears that for the most part, the conservative and practically-minded peasant society opted to disregard advances that could increase productivity (such as the generalized use of the water-mill, etc.) in favor of the standard centuries-old practices (Duncan-Jones, 1982; White, 1984); and those who held the pools of capital often exhibited little interests in the entrepreneurial exploitation of resources and technology (an enlightening example is offered by Suetonius §18). The picture is not entirely complete insofar as Wilson (2002) describes a number of impressive capital-intensive technological applications in the agricultural and mineral extraction industries (developed and employed in a number of localities during earlier periods) that were left to die out in the uncertain political condition of the third century (which is, after all, the period we are primarily interested in).

⁷ The occurrence of recurrent epidemics suggests that regional populations frequently declined (Duncan-Jones, 1996), though population numbers need not have decreased simultaneously in all localities and regions (Alston, 2001). Hopkins (1980), Duncan-Jones (1982), and Harl (1996) take the position that the empire's population was never much larger than 54-60 million in the first three centuries A.D., so the likely patterns of high fertility are explained and treated in a manner that preserves the overall population stability hypothesis (e.g., Frier, 2001).

⁸ Towards the end of the second century, the jurists elaborated a theory of *origo*, according to which every inhabitant of the Empire had a specific attachment, which he, by inference, was expected to support. In subsequent decades we hear of people becoming tied to their parental communities, occupations, the municipal offices of their birthplaces, and so on. See also Finley (1985), Duncan-Jones (1990).

⁹ Following a tradition established by Augustus around 27 B.C., permanent standing armies were stationed by the frontiers. In time, these large military formations became more static and fragmented (which is partly attributed to the reorganisation of Septimius Severus (A.D. 193-211), aiming to discourage revolts by ambitious generals). This reduced the possibility of coordinated defence. The situation was further aggravated in subsequent decades by the removal of units due to civil wars as well as internal and external security concerns elsewhere. On the European front, in particular, the organisation of defences in the rear were by and large ignored in the first two centuries A.D., perhaps on account of army self-confidence. Consequently, once the relatively thinly held frontier line was broken, the invad-

ity. Indeed, the 50-year period from the end of the Severan dynasty (A.D. 235) to the accession of Diocletian (A.D. 284) saw no less than 26 emperors and almost as many unsuccessful claimants. Furthermore, in the 260s and 270s, the Gallic provinces and Britain broke away, and a large region of the east became independent. Eventually, the military campaigns of Claudius II (A.D. 268-270), Aurelian (A.D. 270-275) and Probus (A.D. 276-282), by and large restored central control and border security, though a number of peripheral areas were evacuated and many urban areas shrank. Considering that almost every reign saw one or more uprisings, each ruler's concerns revolved primarily around securing the loyalty of the armies and defending the frontiers. As a result, other matters, such as tending to economic development, received less attention.¹⁰ The successive changes in government, foreign invasions, and separatist movements, disrupted economic life (adversely affecting production and trade), and destabilised the state's fiscal/administrative system.¹¹

Moreover, in order to pay for raising/replenishing armies and financing other deficits, the policy-makers and the various contestants to the throne engaged in currency debasements that allowed them to exchange a given weight of silver for more goods and services.¹² It has been suggested that the volume of such coinage perhaps increased seven times from 238 to 274 (Callu, 1975), but even if that were not the actual level, it is widely accepted that the influx of new silver issues tended to increase over time, especially in the third century (Hopkins, 1980; Rathbone, 1996). *Ceteris paribus*, a net increase in the money supply ought to produce inflation. This, in conjunction with a couple of currency changeovers that were attempted towards the end of the

ers could slice through the civilian hinterland virtually as far as they wished. From the mid-third century onwards the development of a mobile reserve corps (ready to march on the somewhat restored road network to any threatened zone in order to deal with invaders that moved and fought on foot) brought about an enlargement in the total military force of the Empire.

¹⁰ Though Probus is reported to have taken measures to encourage the planting of vineyards in one province or to involve the army in large-scale landscaping projects to improve fertility in another province. Then again, the assumption of these activities could reflect the serious economic difficulties that the Empire was going through at that time, and a dire need to restore its production capability.

¹¹ For instance, the maintenance of the principal road network that was necessary to hold the empire together defensively and economically, was by and large left to lapse; and sea-born inter-regional trade seems to have experienced a downturn (Hopkins, 1980; Starr, 1982; Butcher, 1996).

¹² Unlike the ancient Greeks, who resisted currency debasement, the Romans had resorted to this practice as early as the Punic Wars (Schwartz, 1973; Galbraith, 1975; Lo Cascio, 1996). There is some evidence that segments of the Roman public were reluctant to accept the new issues that the government was pumping into circulation through the payment of salaries. However, as *Gresham's Law* predicts, eventually they would opt to pay their dues to the State and to each other using the debased coins, and retain/store the older, more valuable coins as reserve money (if they did not divert their content to non-monetary uses). And the hoard-findings are consistent with this picture. See also Johnson (1936), Jones (1964), Galbraith (1975), Hopkins (1982), Casey (1996), Lo Cascio (1996), Rathbone (1996). Paarlberg (1993) and Harl (1996) provide examples of citizens actively joining the debasement process.

period, is believed to have deepened the public's loss of confidence towards the currency as a store of value, and affected a shift to barter transactions (and Rathbone, 1996, suspects that several late third century hoards reflect demonetisation). At the same time, government concerns over the declining value of tax revenue (paid in terms of debased currency) are believed to have caused the authorities to insist that more requisitions be made (and taxes be paid) in kind, in order to feed and clothe (a growing number of) troops and civil servants, and finance government projects and services.¹³ Considering that most of the peasantry already lived on a subsistence level and engaged in few monetary transactions, while people in cities continued to trade in terms of money, we can infer that there was no wide reversion from a monetary to a demonetised economy. However, the proliferation of transactions in kind must have posed a number of efficiency challenges with regard to government¹⁴ and economic performance.¹⁵ Indeed, if the introduction of barter practices always leads to inferior

¹³ Indeed, although the payment of State expenses in terms of debased silver issues (pegged to gold), allowed the government to profit by capturing the difference between the official face value and the (relatively) lower cost of production, this *seigniorage* was lost insofar as the government accepted the debased silver coinage in taxation under the prevailing official rate of exchange for gold. Consequently, the government had good reasons -whether gradually or in very few strokes (Jones, 1953)- to resort to requisitions in kind and the commutation of money taxes to levies in kind. However, the perception of a switch in the manner of taxation is not universally accepted. Harl (1996) suspects that the increased documentation of taxation in kind, may reflect not so much a change in policy, but rather the ruthless efficiency of imperial officials.

Taxation in kind had always been a part of the system, and, indeed, is quite feasible where delivery to the point of consumption is viable. So, as the formerly large military formations had been reduced in size and dispersed in the form of regional tactical units (footnote 9), perhaps it was relatively easy to supply them with locally raised taxes and requisitions in kind (Jones, 1953; Whittaker, 1980; Duncan-Jones, 1982, 1990; Fulford, 1996). Casey (1996) and Fulford (1996) suggest that there existed considerable know-how in coordinating both the pay and supply of distant units from the regional headquarters (particularly given that total reliance on the resources of the immediate province was probably the exception rather than the rule in the first two centuries). However, in the course of the third century the situation probably changed, although the continued existence of the long-distance supply routes from the Mediterranean to the northern provinces is occasionally attested (Fulford, 1996). This would be consistent with the general decline of inter-regional trade (footnote 11).

¹⁴ Indeed, if the use of money makes the command of distant resources easy, but the central authorities can no longer transfer significant amounts of money from one end of a large territory to another, then their control is likely to break down (Hopkins, 1980). In the case of the Roman Empire, considering that over 65% of imperial revenues came from the eastern provinces, while two thirds of the army were stationed in the (relatively more exposed) western provinces, the fiscal problems for western administrators would become insoluble in the long run, even if the eastern administration sought to support the western in subsequent centuries (through the occasional provision of money, troops, heads of government, etc.).

¹⁵ Especially in the Roman Empire, where (a) taxes paid in terms of money are believed to have stimulated trade, and (b) government expenditure is believed to have constituted the engine that drove the economy (Fulford, 1996; Harl, 1996). The argument is that the rich tax-exporting provinces in the inner empire recovered the means by which they could pay taxes by selling goods to the frontier provinces (such as the later-monetised provinces in western and central Europe) where the armies were stationed, i.e., where the government directed most of its revenue and newly minted, increasingly debased, coinage. Consequently, to the extent that the provision of armies came to rely on increased taxation/requisitions in kind from local/regional resources (instead of money-taxes) the volume of long-

economic results vis-à-vis the performance achieved in a monetary economy, then one ought to expect that even a partial demonetisation would adversely affect the level of total output. At any rate, the general impression from the above is that in the course of the 50-year period of political instability, the empire probably experienced a contraction in terms of total output and real transacted output, *T*.

4. Fiscal and monetary aspects

In considering the question on how the Romans viewed their currency and its function, LoCasco (1996) submits that they very much perceived it as something created by the State and functioned as a weight unit for the needs of the State.¹⁶ Indeed, it was mandatory to accept the genuine coins that carried the imperial portrait, while the production of imitation/counterfeit silver and gold issues was illegal.¹⁷ However, throughout the period under consideration (King, 1996; Harl, 1996), the production of false/unofficial bronze coins (even issues which by their size, fabric, and style were unlikely to deceive anyone) was tolerated for it facilitated transactions when supplies of official bronze coin were not locally available, especially in the frontier provinces in Europe.

In surmising the currency needs of the State over time, we may follow the examples of Hopkins (1980), Starr (1982), and Harl (1996), and consider the extant reports and records pertaining to the largest budgetary item, namely, military expenses, which perhaps consumed about one half-to-two thirds of the State's annual income (Harl, 1996). Since the exercise rests on a small number of extant testimonies and modern conjectures, we should not be preoccupied with absolute sizes as with the broad trend. Table 1 shows that the annual budget for legionary salaries probably rose slowly over the first two centuries, but picked up in the reign of Commodus (A.D. 180-92), whose nominal budget was perhaps twice as big as the corresponding budget of the first em-

distance trade would decline (see also Hopkins, 1982; Fulford, 1996; footnotes 11 and 13). And if the economy grew more fragmented (as a collection of regional, more autarkic economies) then, on the basis of international and interregional trade theory, we ought to expect an overall reduction in prosperity overtime, especially in the provinces whose trade with all other provinces was affected.

¹⁶ There is also a view, expressed by de Cecco (1987, attributed to T.Mommsen), that the Roman coin had always been taken at its face value, whatever its weight for it had the chief testimony of the credibility of the Roman State. Perhaps, we should be bit cautious on such sweeping views, by considering that the embracement and usage of a progressively debased currency, by any public, may -to some extent- reflect the operation of Gresham's Law (particularly if the phenomenon of currency acceptance and usage is observed across time and space, even in societies where the credibility of the state is not high). The issue of public trust towards the currency is also touched again in footnote 33 and page 13.

¹⁷ And severe penalties were imposed on the perpetrators and those who harboured them (Jones, 1964).

Table 1: Estimations of the annual legionary expenses during the 1st - 3rd centuries A.D. in order to determine the pattern of change

Emperor	Reported annual pay of a legionary soldier (in <i>denarii</i>)	Estimated annual cost of a legion (in thousand <i>denarii</i>)	Reported number of legions	Estimated annual burden for the legions (in million <i>denarii</i>)
	(1)	(2)	(3)	(4) = (2) * (3)
1 Augustus (27 B.C. – A.D. 14)	150 → 225	559 → 838	28 → 25	15.6 – 20.9
2 Tiberius (14– 37)	225	838	25	20.9
3 Claudius (37– 41)	"	"	27	22.6
4 Nero (54-68)	"	"	28	23.4
5 Domitian (81-96)	250, 300	930 – 1117	"	26.0 – 31.2
6 Trajan (98-117)	"	"	30	27.9 – 33.5
7 Antoninus Pius (139-61)	"	"	30-33	27.9 – 36.8
8 Marcus Aurelius (161-80)	"	"	30	27.9 – 33.5
9 Commodus (180-92)	300, 375	1117 – 1396	"	33.5 – 41.8
10 Septimius Severus (193-211)	400, 450, 500, 600	1489 – 2234	33	49.1 – 73.7
11 Caracalla (211-17)	600, 675, 750, 900	2234 – 3351	30-33	67.0 – 110.5
12 Severus Alexander (222-35)	"	"	34?	75.9 – 113.9
13 Maximinus Thrax (235-38)	1200, 1350, 1800	4468 – 6702	"	151.9 – 227.8
14 Diocletian (284-305)	7500, 12400	4654 – 7695	68	316.5 – 523.2

Note: According to this exercise, the annual legionary budget in the reign of Severus Alexander was perhaps 3.6-5.4 times larger than the corresponding budget in the later period of the reign of Augustus and the reign of Tiberius. Despite the different point of departure in terms of assumptions and figures, Harl's (1996: 219) estimate of the annual legionary budget in A.D. 230, is 3.6 times larger than the corresponding budget of A.D. 9.

Sources:

- i. Figures in column (1): The lower value in row 1, the higher value in row 9, and the values of 500 and 750 in lines 10 and 11 respectively, are based on Frank (1936: 86). The value in row 2 and the higher value in row 5 are based on Frank (1936: 86), Jones (1953: 295), and Alston (1994: 115). The lower value in row 5 is given by Casey (1996: 115). The lower values in rows 9-11 are based on Starr (1982: 87). The high values in rows 10-13 are given by Alston (1994: 115) and Bland (1996: 68), which are based on the rates provided by M.A.Speidel. Jones (1964: 623) considers the high value in row 13 to be a low estimate for the reign of Diocletian and provides an estimate of 7,500, and Duncan-Jones (1990: 116) an estimate of about 12,400. The other values are based on Alston (1994: 115).
- ii. The calculations in column (2) are based on (a) Starr's (1982: 87) estimate of 2,234 *denarii* as the cost of a legion for a year in the reign on Caracalla, and (b) on the assumption that officers' pay-rises were proportional to those of soldiers earning 600 *denarii*. Alternatively, in considering Casey's (1996: 115) calculations of the probable cost of Hadrian's Wall garrison in terms of the lower-figure payment rate in row 5, it would appear that at the turn of the 1st century, the annual cost of a legion might be around 1.3 thousand *denarii*. However, at this stage (given that we are interested in the trend) it makes no difference which of the alternative aggregation measures is used as the basis for our calculations, as long as it is consistent. Following Duncan-Jones (1990: 114-6,214-6), the legionary unit in row 14, is taken to be 1/6 in terms of size compared to earlier legions, although officer-soldier differentials could be lower in the reign of Diocletian.
- iii. Figures of column (3): The numbers in rows 1, 6, 8, 10 are based on Starr (1982: 110). The lower figure in row 11 is implied by Starr (1982: 87-8) and the higher figure by Frank (1936: 86). The numbers in rows 2 and 7 (the higher figure) are given in Lewis and Reinhold (1955: 490-2). The numbers in rows 3 and 4 are based on the formation of *XV-XXII Primigenia* and *I Italica*, respectively, and the number in row 4 is cross checked with Harl (1996: 216). The lower figure in row 7 is based on Parker and Watson (1992: 591), and the numbers in rows 12 and 14 on Jones (1964: 59).

peror, Augustus (27 B.C. - A.D. 14). By the end of the Severan dynasty (A.D. 235) the budget had re-doubled; and at the time of Diocletian (A.D. 284-305) it had risen further, perhaps by about 3-7 times, compared to the legionary budget required half a century earlier.¹⁸ Indeed, the overall rise in the nominal needs of the Treasury was probably even more marked than the escalation in the legionary component, considering that (a) the number of auxiliary troops increased over time, while their pay-rise was proportional to that of legionaries (Starr, 1982; Alston, 1994); and (b) the size of administrative staff rose further in the reign of Diocletian.¹⁹ However, although indicative, much like other such conjectures and exercises on the matter, the estimated trend-pattern is also somewhat speculative.²⁰

By contrast, the Roman fiscal system was rigid: The main sources of revenue were a capitation tax, tributes assessed on property, *ad valorem* customs duties (all at fixed-rates), along with a 5% succession duty paid by Roman citizens -part of which was probably withheld by intermediaries and never reached State coffers (Harl, 1996). Consequently, if the total revenue did not vary much from year to year, but the State incurred occasional additional expenditures on account of military, infrastructural, ceremonial, relief or other circumstances (including occasional payments/tributes to neighbours -not to delve into treasure seizures by enemies or loss in transport), and given that the Empire lacked access to financial institutions that could voluntarily offer private wealth to bolster its finances in emergencies,²¹ the Government had the following options: (a) to spend stored reserves, (b) to sell public property,²² (c) to confiscate the estates of the rich found guilty of some charge,²³ (d) to raise tax rates,²⁴ (e) to abolish tax exemptions,²⁵ (f) to engage in compulsory purchases below

¹⁸ We also note that the difference might be higher (ranging between 4-10 times, instead) if Rathbone (1996) is right in that there was no-army-wide pay modification by Caracalla (A.D. 211-7).

¹⁹ Especially, if there were no substantial reductions in the relative size of the navy and elite forces budgets, which Starr (1982) estimates to slightly less than a quarter of the legionary budget in the early third century.

²⁰ Harl (1996) suspects that (a) the overall military budget for the land forces (i.e., including pensions, equipment and supplies, but excluding the navy) rose 3.5 times during the period A.D. 9-230; and (b) Diocletian paid out in annual legionary, auxiliary, and elite soldier salaries, 2-4 times more money than Severus Alexander (A.D. 222-35).

²¹ Indeed, unlike post-feudal Europe (where the growth of corporate financing and private money-lending to kings is considered to have been a fundamental element in economic growth), the financial sector in the period under consideration was less entrepreneurial and developed.

²² As Trajan (A.D. 98-117) and Marcus Aurelius (A.D. 161-80) are reported to have done.

²³ As Nero (A.D. 54-68), Domitian (A.D. 81-96), Septimius Severus (A.D. 193-211), Caracalla (A.D. 211-7) are related to have carried out.

²⁴ As Vespasian (A.D. 69-79) is understood to have done. Caracalla's increase of inheritance taxes was probably reversed by his successor, Macrinus (A.D. 217-8).

²⁵ A step taken by Caracalla.

market prices,²⁶ (g) to come up with innovative ways of extracting revenue from the public,²⁷ all of which could -of course- only go up to a point; and/or (h) to finance the difference by issuing more money in the form of its tri-metallic (gold, silver, bronze) currency. In the first two centuries A.D., the latter could be accommodated by (i) the acquisition of war-booty and a hitherto unparalleled exploitation of mines (Harl, 1996:),²⁸ (ii) the revaluation of existing currency, and (iii) the production of new lighter currency or debased currency²⁹ by (preferably) recycling older, finer, issues. However, as access to large foreign treasures run out, the great mines were exploited to exhaustion, and foreign invasions further interrupted production (to the degree that even the rich-in-mines province of Dacia had to be evacuated in the 270s),³⁰ Roman governments were increasingly forced to resort to solution type (h) (Jones, 1953; Duncan-Jones, 1982; Harl, 1996; Rathbone, 1996; Wilson, 2002). Indeed, judging from the findings of progressively debased coinage, the practice seems to have been the solution that nearly all governments from A.D. 64 onwards, resorted to.³¹ However, there is no surviving account indicating what portion of circulating coinage was re-minted or what the velocity of its circulation was.

Numismatic analysis, dating to the reign of Nero (A.D. 54-68), suggests that he brought down the precious content of the widely used high-denomination silver issue, the *denarius*, minted in Rome from about 3.65 to 3.0 grams of silver, presumably to help finance his projects and war expenses. Yet, the extent to which the production of

²⁶ As Caracalla is reported to have carried out. By the time of Diocletian, in nearly all cases, the procedure had taken the form of requisition without payment (Jones, 1953; 1964).

²⁷ Such as imposing the offer of golden gifts from the communities to the emperor, even under the pretence of fictitious victories, in accordance with an Oriental and Hellenistic custom to offer the victorious emperor gifts in the form of gold. See also, Jones (1953; 1964), Starr (1982), Harl (1996).

²⁸ However, it is unknown what amount was absorbed in non-monetary uses (by the private sector and the State) or forwarded to the mints.

²⁹ I.e., coinage that maintained the traditional weight but contained more alloys and less precious metal.

³⁰ According to Jones (1953), as long as the Empire held the province (A.D. 100s-270s), it possessed a steady stock of precious metals, with new production being balanced by wastage (Wilson, 2002; Harl, 1996) and leakages (e.g., Berger, 1996; Bland, 1996; Harl, 1996; van der Vin, 1996; etc.). However, Harl (1996) suspects that by the time of the Roman evacuation, the Dacian mines were probably worked out.

³¹ Though, in several instances (perhaps after the extenuating circumstances were thought to have passed), a number of Roman emperors sought to restore the currency to its previous level, e.g., Domitian (A.D. 81-96), Pertinax (A.D. 193), Macrinus (A.D. 217-8), the elder Gordians (A.D. 238). Lo Cascio (1996) considers the attempts to reverse the debasement of the *denarius*, as appropriate actions of aware governments aiming to forestall the general loss of confidence (and perhaps build confidence) towards the coinage (and, maybe, their rule). However, we have to note that of the three second- and third century governments mentioned above, only Macrinus survived a year; and the numismatic analysis of the coins issued by him reveals a bewildering range of fineness (Bland, 1996). Harl (1996) notes all three governments found themselves outbid for the loyalties of the army, and swiftly went down in ignominious defeat. He also suggests that the Antonine and Severan emperors may have sought to inspire trust towards their coinage through the choice of currency iconography and design.

new currency exceeded the number of earlier issues recycled at the mint and/or withdrawn (per *Gresham's Law*) is unknown. So, in theory, the overall level of money in circulation may or may not have increased. Successive debasements further reduced the coin's silver content; and in the reign of Caracalla (A.D. 198-217) it came to contain 1.66 gram of silver, that is, a reduction of 1.99 grams in the precious content since the issue's first debasement. Caracalla also introduced a radiate issue, (often termed) the *antonianus*, as a double-*denarius* with only 1.6 as much silver as the debased *denarius*, i.e., about 2.65 grams. His successors either switched from one denomination to the other or continued to produce both denominations.³² The last to do so was Gordian III (A.D. 238-244), who issued some series of *denarii* containing 1.46 gram of silver, but for the most part struck *antonianii* of declining fineness, initially containing 2.19 grams of silver, then 1.98, and finally 1.73 gram.³³ The archaeological findings suggest that the new denomination ousted the old denomination from circulation, and that the quality of the *antonianus* deteriorated further. Indeed, the *antonianii* issued by Gallienus (A.D. 253-68) came to contain 0.16 gram of silver, and those of Claudius II (A.D. 268-70) about 0.10-0.04 gram. This corresponds to a reduction of 2.15 grams in the precious content since the issue's introduction.³⁴ As the State was effectively using copper to produce its 'silver' issues, it ceased issuing bronze issues, and in many places in the eastern provinces, the age-old tradition of minting local silver issues came to an end.³⁵

³² On the basis of numismatic evidence, Hopkins (1980) suggests that at the time, the monetary unity of the Empire nearly disintegrated. In fact, he points to comparisons in the weight and fineness of first and second century coins from the city of Rome and the provinces, which reveal that provincial silver coins were cheapened roughly to the same extent as, and sometimes before, silver coins minted in the city of Rome, as is the case in a coordinated monetary policy. However, this is not the case with several series of the third century coins. Harl (1996) suggests that attempts were made to maintain uniformity in the 250s and 260s.

³³ Bland (1996) notes that from about A.D. 238/40 onwards, and unlike the fashion of earlier-dated hoards, the *antonianii* show up in hoards with *denarii*. So he suspects that perhaps the latter were no longer treated as better stores of values to be removed from circulation, which -in turn- suggests that (by then) the *antonianii* commanded a more realistic tariff (perhaps valued at one and a half *denarii*). If that were so, and the production of more *antonianii* no longer affected (via the operation of *Gresham's Law*) the withdrawal of extant earlier issues, then perhaps the money supply did increase. On the other hand, the withdrawal of both *denarii* and *antonianii* may reflect the introduction of even baser *antonianii*.

³⁴ It is likely that the drastic debasement reflects a disruption in the supply of silver caused by Frankish, Gothic, Moorish, and Persian invasions or the decline/cessation of mining operations due to other reasons (Whittaker, 1980; Harl, 1996; Wilson, 2002). Indeed, a severe shortage in the production of Spanish silver in the western part of the empire would fit with the picture provided by King (1996) apropos the dearth of coinage leading to the production of forged *antonianii* during A.D. 260-285 with semi-official sanction or tolerance.

³⁵ These were supplanted in the 250s-270s by debased *antonianii*, coming out of new state-mints, the establishment of which has also been taken as reflective of the difficulties and costs in the supply of

As the Gothic invasions affected the evacuation of Dacia in A.D. 270/1 and exacerbated the situation, Aurelian (270-275) formally called in all previous silver issues in order to re-mint (presumably large amounts of)³⁶ a new series of silver-plated bronze coins, (often termed) the *aurelianius*, with a silver content of 0.19 gram. It was an unconventional step that had the dual advantage of (a) resolving the immediate fiscal problems by extracting precious metal out of the 'silver' currency held by the public (unless only low-grade *antonianii* were turned in), and (b) affecting a homogenization of the various series of currencies that had been issued over the ages and possessed different sizes and content. However, as the pressure on the mints lead to a strike, it is doubtful whether the old issues were eventually demonetized in the way and scale Aurelian envisioned. Indeed, it is doubtful whether the reform was fully effected in the western provinces (Jones, 1964; Sutherland, 1992; Harl, 1996). Rathbone (1996) suggests that a damage in the credibility of the old issues led to their devaluation in relation to the new silver and gold issues, although there is also evidence that older issues survived as stores of value down to the time of Diocletian (Butcher, 1996). At any rate, as the reform was intended as a currency-changeover, it is conceivable that it caused (or contributed to) some confusion,³⁷ and uneasiness towards the use of currency. Consequently, the incident may have contributed to the adoption of barter practices by a segment of the population (Harl, 1996).

Aurelian's assassination, initiated a new round of revolving emperors, which ended in 284, when Diocletian ascended to the throne and engaged in a new set of reforms. In particular, he:

- (1) Sought to provide a stable government by setting up a (diarchic and subsequently) tetrarchic, non-hereditary system which he coordinated, with each colleague con-

coinage from the central mint, and indicative of the urgent cash needs of the frontiers. At any rate, the suspension of many local currencies in the eastern part of the Empire, perhaps inadvertently, deepened its integration in terms of currency areas. However, the all-important mint of Alexandria in Egypt carried on issuing its own silver issue, the gradually debased *tetradrachm*, up to the reform of Diocletian in the mid-290s, at which point the coin not only went out of production but also lost its status as legal tender (and given that it does not appear in hoards with post-296 coin, one suspects it was probably recycled at the Alexandrian mint). Consequently, it is quite likely that the Diocletianic reform would be perceived in Egypt as a currency changeover, which -in turn- may have produced a transitory inflationary effect that is reflected in the extant local prices. See also: Bowman (1980), Sutherland (1992), Butcher (1996), Harl (1996), Howegego (1996), Rathbone (1996).

³⁶ For how else would he replace all the money issued (whether circulating or stored) over the centuries?

³⁷ Which was perhaps accompanied by some short-term inflation -especially, if the rounding up of commodity prices in the wake of the 2002 euro-changeover is any guide.

centrating on the security and stability of a specified territory -himself securing the eastern region.

- (2) Carried an empire-wide census and prepared an annual budget (the first in history, according to Jones, 1964). In particular, he took measures to consolidate the fiscal changes and experiments of the previous century by systematising the State's assessments and requisitions in kind, whereby the tax-surpluses from one sub-region (province) were fed to another within the same region (diocese) in order to supply or reimburse State troops and officials in wheat-rations instead of money, while any residual surplus (in the form of gold and silver coinage, and -in certain circumstances- products) was passed to the central Treasury (Fulford, 1996).
- (3) Undertook a massive programme of building and reconstructing defensive works programmes on all frontiers that were to be held by sheer force of numbers. At the core of the military machine was a (newly established or enlarged) central-reserve corps which allowed Diocletian to tackle insurgencies, repel foreign invasions, and reclaim Mesopotamia. However, the army's relative enormity (compared to the army-sizes of the first two centuries A.D.),³⁸ in all likelihood, also put a strain on the manpower of the Empire. Perhaps it is in this context (as the economy reached its production and tax-yielding limits) that the government sought to ensure/freeze its production structure by attaching the free peasants of earlier eras to the land as serfs, and others to their occupations and civic functions (see also footnote 8).
- (4) Increased the numbers of administrative staff to (a) ensure a more detailed supervision of affairs in the (subdivided, newly established) ninety-six small territorial units of the Empire, and (b) run the new sophisticated regional and sub-regional system that monitored and directed the monetary and in-kind revenues/expenses, as well as the output produced by state factories of arms, textiles, etc.³⁹

³⁸ However, there is a debate as regards its pattern of growth. For instance, Starr (1982) suggests that Diocletian nearly doubled the Empire's military forces from about 3 hundred thousand men (which was as large a total as the empire's early third century resources could support without undue stress) to about 5 hundred thousand. On the other hand, Harl (1996), though cognisant of even higher figures for the size of Diocletian's army, puts forward a lower estimate: He suggests that the Roman army numbered 3-3.3 hundred thousand under the Julio-Claudians, 3.6-4 under the Flavians and Antonines, 4.5-4.7 under the first Severans, grew larger in the 50 year period of political instability and civil war, and its size was brought down to the Severan level (perhaps 4.3-4.5 hundred thousand) by Diocletian.

³⁹ The process involved more supervision than the collection of money taxes (as there were more problems over quality, quantity and delivery) and the collection of taxes in kind during earlier eras (see footnote 13, end of the first paragraph). Consequently, we ought to expect an increase in local bureaucracy (for instance, more accountants) even if the references to wheat-rations and the other taxes-in-kind

(5) Sought to restore trust to the monetary transactions by reforming the chaotic state of currency, and providing a united currency. So without formally recalling the *aureliani*, he set out in A.D. 293-296 to issue new gold and silver coins of good quality, actually marked with their weight. Apparently, the fineness of the silver issue (perhaps called, the *denarius argenteus* or *argenteus nummus*) was raised to the old Neronian standard. So, it is conceivable that he also aspired to recreate the old tri-metallic currency system, though he probably lacked enough precious metal to produce gold and silver issues in large numbers. To acquire the necessary metal, he would have to somehow ‘unfreeze’ the stores of gold and silver held by private individuals and temples, and, indeed, he appears to have levied a number of dues to be paid in gold -a policy that was followed by his successors, as well (Jones, 1953; 1964; Hopkins, 1980; Whittaker, 1980).⁴⁰ However, on the whole, he probably financed the State deficits expenses associated with his other policies, by minting significant quantities of new silver-plated and plain bronze issues through an expanded network of 15 mints. Numismatic analysis suggests that his silver-plated issue, perhaps called, the *denarius communis*, contained 0.4 gram of silver, i.e., approximately 2.5 times more than the original *aurelianus*. On the whole, there is little doubt that the Diocletianic economy was a monetised, interconnected, economy (Starr, 1982; Hendy, 1985; Sutherland, 1992; Harl, 1996).⁴¹

i) Assessing the monetary aspects prior to the reign of Diocletian

Having gained a good picture of the Empire’s circumstances and policy development and, we draw attention to the following aspects:

(1) Although the State budget appears to have increased overtime, we are not certain of its size and composition. In all likelihood, requisitions in kind grew in importance, especially in the 50-year period of political instability and the civil war that preceded the reign of Diocletian. However, the production of more currency (de-

(did not require the supervision and delivery of vast amounts of goods, but) were merely a sophisticated system of paper transactions and local schemes for subsidized food.

⁴⁰ Jones (1953) and Bowman (1980) also give a very nice example dating to A.D. 306-8, on how this worked. Bowman (1980) and Bagnall (1985) suggest that Diocletian may have set the gold and silver issues at an artificial peg, whereby the *denarius argenteus* was overvalued in relation to the uncoined silver (or perhaps the gold issue was undervalued compared to uncoined gold and silver?).

⁴¹ This is well illustrated by the discovery, in the westernmost province, of Diocletianic bronze coins, minted before and after A.D. 295/6, from nearly all mints of the empire (Abad, 1996).

based or not) suggests the presence of imbalances between monetary incomings and outgoings; while the production of debased currency, in particular, implies a dearth in sufficient amounts of newly mined precious metals and/or perhaps some economizing by the State via the recycling of the existing monetised stock of precious metals (amassed through taxation, confiscation, etc.). Indeed, it is conceivable that currency debasement was the most attractive option to policymakers to finance the State deficit.

- (2) Throughout the long debasement period, the authorities did not alter the long-standing peg between the new 'silver' coins and the gold pieces,⁴² until it was abandoned by Aurelian (A.D. 270-5). Thus, in theory, the debased 'silver' issues could be exchanged for the same number of gold pieces as if they were as good as the old silver coins. However, in practice, through the operation of *Gresham's Law*, this policy induced the diversion of gold from coinage to plate and jewellery. So it is not surprising that at some point, the Treasury run out of gold and could not support the minting of proper gold coins on several occasions. Indeed, it appears that some governments did not strike gold coins at all, and gold coins became scarce,⁴³ while other governments resorted to arbitrary confiscations and new ways of extracting gold from the public to build up state reserves, until Diocletian and his successors formally levied a number of dues to be paid in gold.
- (3) In addition to triggering the transfer of gold to non-monetary uses, the repeated debasements of silver currency also drove successions of earlier, less debased, silver issues out of circulation (perhaps, as stores of value that commanded a premium), until, as Galbraith (1975) observes, the Empire effectively converted from a tri-metallic monetary standard to a (nominally silver, yet) bronze monometallic standard.
- (4) As the actual production of bronze currency was for the most part discontinued by the authorities in the second half of the third century, until the reform of Dio-

⁴² Though they, too, did grow lighter.

⁴³ Jones (1953; 1964), Whittaker (1980), Sutherland (1992). Consequently, even the gold issues found in hoards, ought to be considered as prestige objects and donatives rather than currency -not to be fitted into a series of declining weight and purity gold currency standards (Bland, 1996). In other words, at some point after A.D. 235, the Government split the functions of its gold issues from its 'silver' and copper coinage (Harl, 1996).

cletian, we need not attribute any surge in the price levels during the 260s-to-280s to a rise in the supply of low-denomination bronze currency.⁴⁴

- (5) We cannot quantify how much silver (or gold) coinage was supplied by any one emperor. Consequently, we can only talk in impressionistic terms of heavy or light minting of certain issues by particular emperors. To the extent that the regular payment of salaries to the military and civic service personnel, necessitated the production of debased silver currency (for, undoubtedly, a part, possibly a growing part, could be paid -and was paid- in kind), the money supply would tend to increase. However, the recycling of earlier issues at the mint in order to produce the debased coins out of the existing stock of currency, and/or the withdrawal from circulation of previous, finer, issues, in accordance with *Gresham's Law*, would counterbalance -whether partially or wholly- the initial increase in the money supply.
- (6) At any rate, it is possible that, over time, there was a gradual increase in the stock of coinage in circulation (Rathbone, 1996; Harl, 1996), even if not all of it was genuine and accepted by the State. However, to the degree that government salaries were by and large directed to army personnel stationed in the later-acquired, sparsely populated, previously non-monetised or least monetised, frontier territories of the empire, the impact of an increase in the money supply would be tempered by the relatively low velocity of money in the particular provinces.⁴⁵ Consequently, we should, perhaps, not expect significant rises in the left-hand side of the *Equation of Exchange* (i.e., the sum of weighted regional products of MV) before the share of populations engaging in very few transactions declined on account of (a) the loss of the outer/peripheral imperial territories, and (b) the abandonment of money, especially overvalued currency, by infrequent/unaccustomed users, especially around the time of Aurelian's reform. Both developments would affect a rise in the average number of times a typical unit of currency turned over, and were perhaps fulfilled within the 50-year period that preceded the reign of Diocletian, especially as the crisis deepened.

⁴⁴ We may hypothesize that the overall stock of bronze coinage in circulation remained more or less constant, and did not decline (although bronze issues were more likely to be lost compared to more valuable issues, e.g., Reece, 1996), for if the public's (presumably constant) needs in a province were not satisfied by the supply of genuine bronze issues, false would circulate, until such time as genuine issues reentered the province.

⁴⁵ The issue of velocity is separate from monetisation, which -incidentally- may have occurred at a larger extent than in previous centuries, e.g., in Egypt (Rathbone, 1996).

(7) The contraction of the Empire, along with the devastations/disruption in production brought by foreign invasions and civil war, the fragmentation/regionalisation of the economy and the decline in interregional trade, in conjunction with the expansion in barter practices, ought to have brought about an overall reduction in the physical volume of goods and services transacted for currency. In conjunction with a rise in either M or V or both (or even if the left-hand side of the *Equation of Exchange* did not rise much), this would necessitate an escalation of P . So, perhaps we should expect the inflation to occur at a time that the above conditions prevailed, which is the 50-year period that preceded the reign of Diocletian, especially when the situation deteriorated.

Indeed there exist sufficient indications of price surges for a number of goods in the 270s-280s (Johnson, 1936; Rathbone, 1996).

ii) The reforms of Diocletian

As already mentioned, Diocletian took steps to provide internal stability, security, and domestic production, which probably allowed the economy to grow, and then operate at full capacity. So, perhaps we ought to expect that the economy enjoyed a period of escalating total output until it stabilised. He also carried a number of expensive, defensive and administrative, reforms. If a substantial part of the salaries associated with these programmes was directed in the form of monetary payments to recipients (such as administrators and the central-reserve corps) living in cities and provinces where the velocity of circulation was above the average, then the monetary expansion would produce a rather obvious rise on the left hand side of the *Equation of Exchange*.⁴⁶ Consequently, and although the M would continue to increase, the conditions might yield an ambivalent effect (or no effect with regard) to the direction of P , up to the time that the overall production of the Empire (including T) reached its upper limits. In this respect, Rathbone (1996) notes that prices in Egypt were stable during the early period of Diocletian's reign, up until the mid-290s. At any rate, the received wisdom is that, overall, the overwhelming/unprecedented increase in the money sup-

⁴⁶ This might be further induced if the Treasury retrieved less currency due to (some or considerable) commutation of money taxes to levies in kind. According to Jones (1964) a greater portion of the budget involved stored non-monetary surpluses. We also note that Diocletian's monetary expansions did not involve debasements. Consequently, they did not generate the simultaneous, yet opposite, *Gresham Law*-type currency withdrawals that tended to soften the inflationary pressures of the monetary expansion of previous Roman governments.

ply (especially ‘silver’/bronze issues) in the reign of Diocletian, eventually brought about pronounced price increases (Schwartz, 1973; Duncan-Jones, 1982; Harl, 1996).

But, this is not the full story; though the second part of it, is perhaps not widely known or recognised for its inflationary impact: In 301, Diocletian apparently issued a Currency Edict, effective September 1st, doubling the face value of the silver and copper issues (Erim et al., 1971; Whittaker, 1980; Bagnall, 1985; Lo Cascio, 1996; Rathbone, 1996; Harl, 1996; and the literature mentioned therein). Perhaps he hoped to raise the purchasing capacity of his (military and administrative) staff or make the possession of these coins more attractive and influence the ‘unfreezing’ of the outstanding precious metal (gold) that was held in private stores.⁴⁷ Nonetheless, what he achieved, was to double the money supply at one stroke. With V and T nearly fixed in the very short term, the only variable left to absorb the shock within the *Equation of Exchange* framework was P . Rathbone (1996) submits that the prices of several goods jumped up immediately afterwards, as a consequence of the Edict.⁴⁸

So, in late November - early December of 301, Diocletian attempted to counter the inflation by setting (a) price ceilings through a Price Edict, covering 900 commodities, 130 grades of labour, and various freight rates, and (b) the death penalty for the transgressing buyer and seller (Frank, 1936; Walbank, 1951; Jones, 1964; Lauffer, 1971; Schwartz, 1973; Barnes, 1981; Duncan-Jones, 1982; Paarlberg, 1993; Harl, 1996).⁴⁹ A number of economic historians have noticed that the Edict’s prices of commodities against gold maintain an astonishing, even suspicious, stability to those of much earlier eras (Whittaker, 1980); and that the stipulations of the Edict do not allow for regional variations, seasonal fluctuations, wholesale/retail differentials, and are incompatible with transportation costs.⁵⁰ So it is conceivable that, at the very

⁴⁷ Such an intent would be consistent with the overall policy of extracting gold from the public via alternative means (footnote 27). If the author of the Edict aspired to affect/induce the return of hoarded gold back to the market, which the government could then purchase in exchange for the ‘high value’ coins it had created by imperial fiat, then the attempt should probably be considered as the most imaginative in a long succession of earlier and subsequent government endeavours.

⁴⁸ Rathbone (1996) is also of the opinion that the reform (the third in a row after Aurelian’s and Diocletian’s 293-295/6 currency reform) destroyed the currency’s credibility and perhaps amplified the public and private tendency to revert into an economy in kind in the 4th century.

⁴⁹ The action was not very inordinate for the society (Harl, 1996). Whittaker (1980) notes, that the language employed in the preamble (attacking extortionate prices by profiteers who strip soldiers of their pay) provides evidence not only of the persistence of inflationary pressure, but also that the market refused to accept the soldiers’ pieces, at their face value. On the other hand, a scapegoat would have to be invented, especially if the government’s military salaries had failed to keep pace with silver coinage prices (Whittaker, 1980; Duncan-Jones, 1990).

⁵⁰ See Duncan-Jones (1982). In considering the Edict’s sea transport rates for 57 specified trips between five named ports in the eastern half of the Empire and every port in the Mediterranean, he concludes

least, the Edict's price figures (a) served as indicators of what the Administration would pay for goods and services to supply the army and Court, and (b) were intended to secure the compliance of State-purchasers and Government suppliers, thus 'inoculating' the Government from the inflationary effects of its Currency Edict.

One suspects that the price ceilings exceeded the equilibrium levels of prices in a number of urban and -thus- monetised centres in the east (such as Nicomedia, Diocletian's headquarters). This is consistent with the testimony of Lactantius (§7.6-7), who had served in Diocletian's Court, that the goods disappeared from the market. Consequently, it is quite likely that the law soon turned into a dead letter.⁵¹ Indeed, the policies of (a) increasing the money supply to pay for more salaries (thus, effectively pushing out the aggregate demand schedule) and subsequently doubling it by imperial fiat, while (b) setting price ceilings, are economically inconsistent -though this was unknown to the Roman policymakers of the time.

As a final point, we should probably expect price levels to increase in at least three stages: (a) in the period of political instability; (b) in the period of Diocletian's restoration and policy-driven monetary expansion; and (c) in the wake of his instant monetary expansion (through the Currency Edict). We now turn to the price data.

5. The estimation of a price inflation proxy from the accounts of Egyptian wheat

As is known to students of economic history, the calculation of inflation rates from antiquity is subject to a number of limitations. First, and foremost, we do not deal with figures collected at regular intervals through representative and properly weighted statistical samples. We do not even have very many prices from various centres or annual prices to review. The only plentiful source of commodity prices is Egypt, the famous bread-basket of the ancient Eastern Mediterranean, on account of

that the sea transport cost figures of the Edict are so low that they appear unrealistic in view of what is known of the slowness and ineffectiveness of Roman shipping.

⁵¹ It is unclear as to whether the Price Edict was even promulgated in the western part of the Empire for no fragments of it have been found there, although Diocletian issued it in the name of all his colleagues. One would think that the west was also affected by the initial doubling in the value of the *denarius*, given that the legal claim of a civilian or an official at a shop or a tavern for the new purchasing power of his *denarius*, ought to be as valid in Marseilles as it was in Antioch. And if the Price Edict was intended to provide consumer protection, the circumstances were such to warrant its application, publication, and reproduction throughout the Empire (indeed, the clarifications would be most zealously plastered and quoted all over). However, if the Edict was primarily intended to provide instructions to a small number of imperial financial officers and regional Treasury Department heads, then perhaps less durable copies would suffice. It is also unclear as to whether the Price Edict was enforced beyond Diocletian's retirement in A.D. 305. At any rate, a papyrus dated to A.D. 335 gives a wheat price 63 times higher than the wheat price mentioned in the Price Edict.

the recovery of a good number of ancient records written on papyri and ostraca, dated by the archaeologists.⁵² Thus, to derive a measure of the price change, it is necessary for us to rely on commodities whose prices are encountered several times in the records, and this happens mainly with wheat. Unfortunately, wheat prices were prone to seasonal fluctuations and local price variations. On the other hand, wheat formed the basic diet of the vast majority of the people, and was the largest item in their food bill, while it reportedly exhibited little variation in quality -which is not the case with other goods such as wine, oil, and meat, or real estate (Jones, 1953; Duncan-Jones, 1982; 1990; Rathbone, 1996; Harl, 1996).

The surviving data on wheat prices come from a variety of sporadic sources, years apart, such as a list of a day's private transactions in Lower Egypt, an officer's account of purchases (that might be below market prices) in Upper Egypt, and so on. To get a sense of the trend, we take the average price encountered in a specific year, construct an average for a three-decade period (thus reducing the effect of seasonal or transitory fluctuations), and compare it to similar averages over time. The method of index-construction is slightly different from other attempts, though the body of data is by and large the same. We also note that this kind of data may at best help us recover a very crude proxy of price levels and changes. [Table 2]

According to the extant set of prices, usually given in Greco-Egyptian *drachmas* per *artaba*,⁵³ it seems that, on average, the price of wheat generally rose very slowly. Indeed, from the reign of Augustus to the mid-second century, the estimated annual rate of 'inflation' was probably less than 2% (certainly below the 5.6% rate purported

⁵² There is a question as regards the representative aspect of Egyptian prices in relation to the rest of the empire. Indeed, for a long time Egypt formed a different currency area (see footnote 35), though (a) as Rathbone (1996, following E.Christiansen) shows, the silver *tetradrachm* imitated the debasement of the *denarius*; and (b) as Duncan-Jones (1982) points out, Egypt's trade with the other provinces ought to have brought about some price correspondence (if not equalisation). Rathbone (1996) goes to some length in making the argument that Egypt was not so exceptional a province but an integral part of the empire's economic system; and one has to take into consideration that it was home to perhaps about 10-12% of the Empire's population (Harl, 1996). I am inclined to accept the notion that the Egyptian price trend for wheat would not be atypical (even if Egypt exhibited some of the lowest wheat prices in the empire due to the abundant local supply) on the grounds that the rough rate of price changes at the place of an item's origin are likely to be replicated at the place of its consumption (especially considering that the item was essential for consumers and -thus- did not exhibit an elastic demand). This is not to say that the price changes in other commodities (which would also largely contribute to inflation) in Egypt and elsewhere in the empire were mirrored in Egyptian wheat prices. However, the finding is consistent with the general impression and received wisdom that about this time other provinces experienced inflation.

⁵³ The *artaba* used to be a common grain-measure in ancient Egypt, equivalent to 3.33 *kastrensis modii* or 22.41 kilograms in Alexandria. The Greco-Egyptian *drachma* was equivalent to $\frac{1}{4}$ of a *denarius*. It was subdivided to six *obols* before the third century and to seven *obols* thereafter (Johnson, 1936; Jones, 1953; Duncan-Jones, 1990).

by Paarlberg), and it possibly rose to about 8.6-8.8% for the rest of the period under consideration (though the Edict's price-ceiling may actually be a conservative/low price). Consequently, we are inclined to revise the perception of a modest inflation, and conclude that the rate of the inflation-proxy in Egypt during the later part of the third century, although not extreme, was at least serious, and quite comparable to the serious inflation experienced in the industrialized countries in the 1970s and early

Table 2: The Egyptian wheat prices in Greco-Egyptian drachmas per artaba, 18 B.C. – A.D. 301

	years	prices	years	prices	years	prices	decade	average price	estimated annual change
B.C.	18	9.3	78	10.0	154 mean	8.0	B.C. 1 - 10s	4.64	
	13	4.0	"	10.0	155	8.0			0.8 %
	10	2.5	"	10.0	160	7.1	A.D. 0s - 20s	5.66	
	9	2.5	78 mean	10.0	162	8.0			0.1 %
	6/5	1.9	79	8.0	169/70	20.0	30s - 50s	5.95	
	5	8.8	"	11.0	191	18.0	60s - 80s	9.16	1.0 %
	4	3.5	"	11.0	"	20.0			2.2 %
	"	3.5	"	11.0	191 mean	19.0	90s - 110s	12.00	
	"	3.5	"	11.0	192	18.0			- 1.5 %
	4 mean	3.5	79 mean	11.0	246	24.0	120s - 140s	7.45-7.61	
			99	16.0	250	20.0			1.5 %
A.D.	3	3.0	99/100	16.0	253 or 256	16.0	150s - 170s	11.87	
	16	9.0	99 mean	16.0	254?	12.0	180s - 200s	18.50	1.4 %
	22	5.0	100	8.0	255	16.0			
	33	3.0	"	7.0	"	24.0	210s - 230s	...	0.0 %
	45/6	4.4	"	9.0	255?	20.0			
	"	5.7	100 mean	8.0	255 mean	20.0	240s - 260s	19.00	
	"	7.3	112	12.0	256	12.0			8.8 %
	"	7.6	124	9.0	260	12.0	270s - 290s	240.00	
	"	8.0	125	7.1	"	16.0			8.6 %
	"	8.0	128	8.0	260 mean	14.0			
	"	8.0	137	8.0	269?	24.0	301	982.00	
	"	8.0	138	5.6?	276	200.0			
45/6 mean	7.1		149	7 or 8	293	300.0			
	47	8.7	152	8.0	294	220.0			
	56	5.0	153	24.0?	301	640.0			
	65	2.2	154	8.0	"	1332.0			
	68	13.8	"	8.0	301 mean	982.0			
	70	8.8	"	8.0					

Sources:

Most of the above prices are listed by both Duncan-Jones (1990: 151-4) and Drexhage (1991: 13-8) except for the following: The last two prices of A.D. 45/6, the first price of A.D. 79 and of 100, along with those of A.D. 99, 99/100, 128, 137, 149, 152, 154, 155, 162, 246, 293, and 294 are provided by Duncan-Jones; the last two prices of A.D. 255, the first of A.D. 260, along with those of 5 BC, and A.D. 22, 68, 70, 125, 160, 169/70, 250, 253/6 are provided by Drexhage. The price of A.D. 3 is provided by Preisigke and Bilabel (1915: # 7341), that of A.D. 33 by Wilcken (1899: # 1372), the second price of A.D. 100 by Grenfell and Hunt (1901: #133); that of A.D. 138 by the Italian Society of Papyri Research (1912: 281); the low price of A.D. 301 by Rathbone (1996: 239) and the high price of the same year, listed in the Price Edict, by Jones (1953: 295,299-300) and Bagnall (1985: 28). Most of the prices dating to A.D. 45/6-269 are mentioned in Rathbone (1996: 239), though a few are placed in slightly different dates.

1980s (Parkin, 1987). However, a more detailed consideration of the events, indicates that prices probably doubled within the last trimester of 301. The consequential adjustment of inflationary expectations and the resultant prolongation of price increases would certainly be perceived as disturbing by the contemporaries.

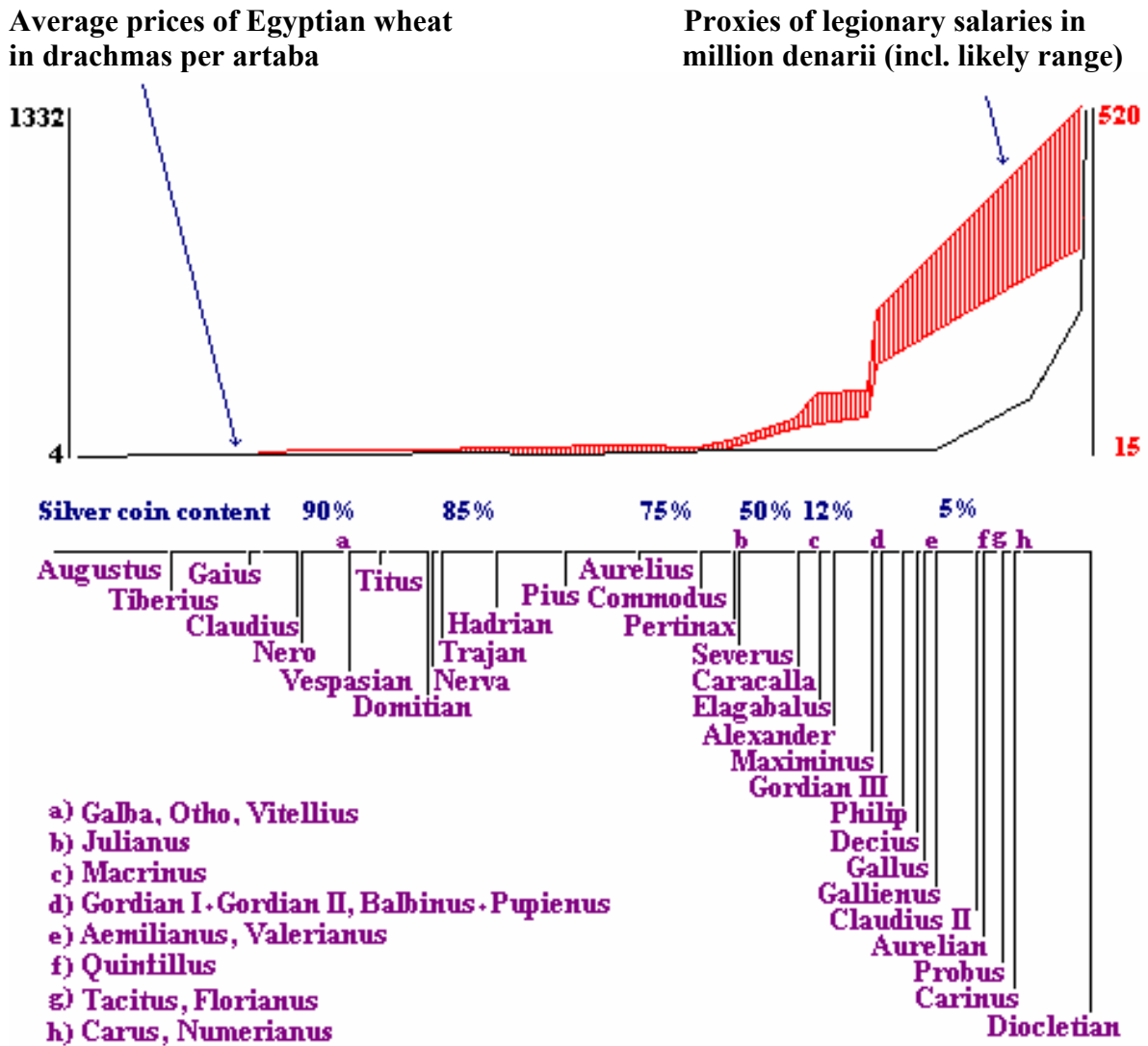
6. Summary and conclusions

It seems that throughout the first three centuries A.D., Roman governments financed their deficits through the production of more money. Modern estimations of that era's inflation rely on a very small sample of extant prices, especially the prices of wheat coming from Egypt, so we ought to be cautious of the results. A number of economic analyses have produced a view that the inflation was prolonged, though modest, 3.6-5.6%. However, a period-by-period treatment of the same evidence suggests that the phenomenon was much shorter in duration (appearing in the last quarter of the third century) while its rate of 8.6-8.8% would be considered serious by modern-day standards. A more detailed consideration of the events suggests that prices probably doubled and the inflation rate perhaps exceeded 100% during the last trimester of A.D. 301.

To summarize the situation, we bring together in Chart 1: (a) the chronology of the government's rising legionary expenditure (based on Table 1) to get a sense of the evolution in the size of the State deficit and the need to issue more money; (b) a rough outline of the successive debasements in the silver coinage; and (c) the evolution of the extant and dated wheat-prices from Egypt (based on Table 2, though for illustrative purposes we provide the pre- and post- Currency Edict prices of A.D. 301 separately). The nominal rise in military expenditure and the successive debasements (which facilitated the production of more coinage) underscore the chronic influx of new currency from the late second century onwards. However, it is highly likely that the consecutive increments in the quantity of (new) money circulating in the economy were counterbalanced, whether partly or wholly, by the operation of *Gresham's Law*. In addition, as government spending was for the most part directed (in the form of salaries) to armies stationed in the less-monetised provinces in the periphery, where the velocity of money was in all likelihood low, the left-hand side of the *Equation of Exchange* may have changed little or not at all. This could help explain the low rate of pronounced price increases in basic goods in the course of the first two and a half cen-

turies. Consequently, both the currency debasement and the changes in the size of the State budget were probably not highly correlated to the long-term price inflation -at least up to last third of the third century.

Chart 1: Wheat prices, legionary costs (and likely ranges of cost), the precious content in the silver coinage, 1st-3rd centuries A.D.



Notes:

- i. The average prices of wheat are reported on the left-hand vertical axis. All values are based on the penultimate column of Table 2, except for the two pertaining to A.D. 301, which are separated in order to better depict the change in the last trimester.
- ii. The proxies and range figures of legionary costs are reported on the right-hand vertical axis. The values are based on the estimates of the final column of Table 1.
- iii. The silver coinage fineness provided in the form of an percentage, below the graph, is approximate and pertains to the average finesse of the issues minted in Rome. The values are based on the sources mentioned in footnote 1.
- iv. The horizontal axis denotes time and provides the succession of emperors from Augustus to Diocletian.

It would appear that at the time, devastations caused by civil wars and foreign invasions (which led to loss of production, infrastructure, and the decline in inter-regional trade), along with a rise in barter practices, adversely affected the physical volume of transactions, T . This development would have certainly stimulated price increases, within the *Equation of Exchange* framework. Other factors that could have further boosted price increases are (a) an increase in the velocity of circulation, a slight or modest rise of which is conceivable; and/or (b) an influx of currency (by the Government or rival governments), which has to be explained in terms of (i) pay-rises, (ii) pay-compensations for equal reductions in provisions in kind, (iii) an expansion in the numbers of administrative staff, (iv) an expansion in the size of the army. Of these, item (i) is unattested, (ii) and (iii) seem unlikely during the climax of political instability/anarchy, and (iv) is plausible (even somewhat attractive) in that it allows for Diocletian to have found a larger-than-usual standing army instead of nearly doubling it (alluded in footnote 38). In short, we propose that the price increase that transpired a few decades prior to the reign of Diocletian ought to be attributed to a decline in T , and, perhaps (unmeasured, though conceivable) rises in V and M .

In the reign on Diocletian, the restoration of internal security and production capacity led to more output and, possibly, to more transactions. However, the direction of large amounts of newly minted currency, in the form of salaries, to areas where the velocity of money was higher (as armies were established or redeployed in more monetised areas and a new and larger government bureaucracy was established in urban centres), would eventually affect a rise in price levels, which is the generally agreed cause of this ancient inflation. However, this is not the whole story: A monetary reform that instantly doubled the money supply in A.D. 301, brought about (hyper-) inflation. Diocletian sought to contain it later in the year, by issuing a strict Price Edict. Nevertheless, the measure was insufficient given that it did not address or hinder the economic forces producing the phenomenon.

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