BANK OF GREECE

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BANK OF GREECE
21, E. Venizelos Avenue
102 50 Athens

Economic Research Department - Secretariat
Tel. (030-1) 320 2392
Fax (030-1) 323 3025

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The drachma on the metallic monetary standards: lessons from the past[1]

Sophia M. Lazaretou
Economic Research Department

1. Introduction

The entry of the drachma into the wide fluctuation band of the Exchange Rate Mechanism of the EMS with the devaluation of March 1998, and the forthcoming participation of Greece in the euro area in 2001 are not the sole efforts in the country's economic history to join a monetary stability club. In the past, Greece has repeatedly made efforts, sometimes successful, to participate in the prevailing international monetary system, such as bimetallism in the first half of the 19th century, the classical gold standard in the last quarter of the same century and the gold-exchange standard in the interwar period, or even to participate in monetary unions such as the Latin Monetary Union (LMU) in the 1860s.

The compilation of the basic monetary aggregates for the Greek economy of the 19th and early 20th century offers us the opportunity to discover why the periods during which the drachma remained under metallic monetary regimes alternated with periods of paper money standards. Metallic monetary regimes can be considered as a contingent rule or a "rule with escape clauses", which allowed the Greek monetary authorities to suspend temporarily convertibility of the national currency into gold or foreign exchange and pursue a discretionary policy, though only when emergency situations,

1 Sincere thanks are due to the participants in the series of seminars held by the Economic Policy Research Institute (Athens, Feb. 1997) and the Cultural Institute of the National Bank of Greece (Athens, June 1997), whose comments were extremely valuable. We would also like to thank Heather Gibson and Panayiotis Kapopoulos for their constructive comments. Full responsibility for any errors or omissions rests exclusively with the author. The views expressed herein are not necessarily those of the Bank of Greece.

such as war or threat of war or financial panics, occurred. Consequently, adherence to the contingent rule strengthens the efforts of the system's peripheral (weak) economies to restore their reputation and improve the terms of their borrowing from the capital markets of core (strong) economies.

Considering Greece of the 19th and the early 20th century a typical example of a peripheral country, this paper seeks, first, to present the factors that led the country to adopt the metallic monetary regimes and, second, to explain the choice of the time of switching from a fiat monetary standard to the specie convertibility rule. Historical evidence as well as available empirical data allow researchers to answer the question of why a peripheral, economically weak country willingly adhered to the gold standard rule of convertibility, enforced by a centre country, and accepted the cost of the anti-inflationary effort. Additionally, we can ask whether under this regime this country benefited from long-term foreign borrowing.

The remainder of the paper is divided into four sections. Section 2 briefly analyses the concept of metallic monetary regimes, presents the basic features distinguishing core from peripheral countries participating in the regime and explains why we consider Greece a typical example of a peripheral country. Section 3, relying upon historical experience and using the historical time series for monetary aggregates, attempts, first, to explain the governments' intention to adhere consistently to the convertibility rule and, second, to list the benefits for the Greek economy. Finally, Section 4 summarises the main conclusions of the paper.

2. Metallic monetary standards as a contingent rule

By the term metallic monetary standards we imply those regimes under which some precious metal, such as gold and/or silver, is used as a "numeraire", namely as a standard by which the value of all other currencies is determined. These regimes can be considered as a mechanism for the governments' credible commitment to pursue "time consistent" fiscal and monetary policies. This means that, under the convertibility rule, governments followed a "rule with escape clauses", depending on the contingencies prevailing at any time.

More specifically, in emergency situations the monetary authorities of the country under the gold standard could suspend convertibility and issue paper money in order to cover excess borrowing requirements. Emergency situations include war or the threat of war, as well as financial crises and bank panics, that is contingencies generating extraordinary needs, the onset and end of which are not known in advance. The suspension of specie convertibility would only be temporary. Once the reasons for the suspension were gone, the government was expected to adopt measures of fiscal and monetary stringency, so that the country, at some time in the future, could revert to the convertibility rule.

Under fixed exchange rates, the government can finance increased spending via taxes on income of capital and labour or debt issue. The latter occurs only in the case that the government retains its credibility as a debtor and thus can draw funds from international capital markets.

In the context of the simple optimum taxation model, the problem of a household consists in the maximisation of the discounted value of its utility function, subject to its income constraint:

$$\max_{\{c_t\},\ \{n_t\},\ \{k_{t+1}\}} E_t \sum_{t=0}^{\infty} \beta^t U(c_t, g_t, n_t) \qquad (1)$$

subject to

$$k_{t+1} + c_t \leq k_t + (1-\theta_t) r_t k_t + (1-\tau_t) w_t n_t \qquad (2)$$

where c_t is consumption, n_t working hours, g_t *per capita* government expenditure, k_t capital, θ_t and τ_t the tax rates for income derived from capital and labour respectively, w_t is the real wage and r_t is the interest rate. In other words, the household should opt for the optimum path $x_0 = \{c_t, n_t, k_{t+1}\}_{t=0}^{\infty}$, while the government opts for the optimum path $y_0 = \{\theta_t, \tau_t\}_{t=0}^{\infty}$.

Summing up for all households of the economy and dividing by the population, the problem is reformulated in *per capita* terms as follows:

$$\max_{\{\theta_t\},\ \{\tau_t\}} E_t \sum_{t=0}^{\infty} \beta^t U(c_t, n_t, g_t) \qquad (1')$$

subject to

$$g_t = \theta_t r_t k_t + \tau_t w_t n_t \qquad (2')$$

It is clear that the household's optimal decision at time t depends upon the government's decision on the future values of economic policy instruments, that is,

$$x_0\ (y_0) = \Big\{ c_t\{\theta_t, \tau_t\}_{t=0}^{\infty},\ n_t\{\theta_t, \tau_t\}_{t=0}^{\infty},\ k_{t+1}\{\theta_t, \tau_t\}_{t=0}^{\infty} \Big\}_{t=0}^{\infty}$$

The time inconsistency problem of the optimal path arises as follows. Let y_0^* be the optimal path of coefficients θ_t and τ_t at time $s=0$. If we solve the problem once more for time $s>0$, then the optimal path, y_s^*, $t=s, s+1, s+2,...$, is different from path y_0^*, $s=0$. The time inconsistency of paths is explained by the fact that households form their attitude at time $s=0$, taking into account the effect of the economic policy to be pursued in future periods, $s+1, s+2,....$ Therefore, the optimal path, y_0^*, $s=0$ takes into account the effects of the economic policy implemented by the government after the period $t=s=0$ on the public's decisions as they were formed in the periods prior to $s=0$.

It is also assumed that the government balances its budget in every period, since increases in expenditure are met with increases in τ_t and θ_t. However, due to the distortions caused by income taxation (negative effect on labour supply and capital accumulation), the government considers debt issue as an alternative option for financing fiscal deficits. In this case, the income constraint of the government is written as follows:

$$g_t + (1-\varphi_t) q_t b_t \leq q_t b_{t+1} + \tau_t w_t n_t + \theta_t r_t k_t$$

where b_t is the real market value of existing public debt, q_t is the price of public debt bonds, $q_t = (1-\varphi_{t+1})/(1+r_t)$, $q_t b_t$ is the discounted value of public debt and φt is the default rate of the debt in each period via inflation.

Since there is no mechanism committing the government's actions, the latter will try at time $t+1$ to erode an ever-increasing percentage of the debt

value, by causing an inflation surprise.[2] In this way, the need to impose an income tax in future periods is considerably reduced. At the same time, however, it strengthens public expectations that such a policy will be repeated in the future, negatively affecting the price of government securities (q_t).

The time inconsistency problem may be resolved by establishing rules or laws imposing a commitment mechanism on the government. The gold standard has been regarded as a contingent rule (see Bordo and Kydland, 1995). Assume $\lambda_t=1$ if the country is on the gold standard at time t and $\lambda_t=0$ if the country is on a paper standard at any other time. In wartime emergency the government suspends specie payments, committing itself, however, to revert to convertibility once the war is over, that is $\lambda_t=0$ if $t\in[a, b+d]$, where a is the start of the war, b its end and d is a short period of adjustment, while $\lambda_t=1$ for any other period. The temporary suspension of convertibility provides the government with the opportunity to finance wartime spending by paper money creation and/or debt issue (Lucas and Stokey, 1983, Bordo and Schwartz, 1994). Private agents are willing to hold in their portfolio government bonds, since they expect that the suspension of convertibility will last just as long as the war and that after the war, or when spending becomes moderate again, the government will enact an anti-inflationary policy, so as to restore specie payments at some future date. Consequently, the debt will be repaid in banknotes readily convertible into gold at the pre-war parity.

If the government does not adhere to the rule, namely $\lambda_t=0$ if $t\in[a, b+d]$ and $\lambda_t=0$ t, thus choosing a high percentage for φ, public behaviour will be totally different in the face of a future war. In this case, the public is bound to consider the government unreliable in its promise for a resumption of gold convertibility once the war is over, and consequently, they will seem reluctant to hold government bonds in their portfolio, thus making the financing of new wartime spending more difficult.

The benefits from the pursuit of a contingent rule are quite important. First, the government can successfully cover its excess borrowing needs by issuing bonds and trading them in the domestic or foreign money market. This happens because private agents, knowing that the government is credibly pursuing a contingent rule, will be willing to hold government bonds in their portfolio, since they anticipate that, after the end of the unexpected event, the government will adopt measures of fiscal consolidation and monetary restraint that will allow metallic flows to be resumed and the debt to be paid off either in metallic or national currency, at the initial parity. Second, if the government really pursues such a policy and successfully restores the specie standard rule, then agents will again be willing to lend to the government in the future in view of the new emergency.

For a peripheral country with an underdeveloped domestic money market, entry into the metallic monetary regime would significantly improve its creditworthiness in international capital markets. More specifically, whenever the government of a

2 This occurs only in the case of an inflation surprise and when the debt is long-term and not short-term. Expected inflation is incorporated into the interest rate of government bonds, increasing the real value of expenditure on debt servicing.

peripheral country relied upon foreign borrowing to finance excess spending, foreign creditors would grant a loan only on the condition that the national currency would be linked with the prevailing international monetary system, since the possibility of conducting an expansionary fiscal and monetary policy would be minimised. Consequently, the conduct of a monetary policy consistent with the preservation of the currency's fixed exchange rate prevented the government from a default on its debt to its foreign creditors and a unilateral suspension of payments or payments in devalued currency. In this way, pledges were provided that the debt would be ultimately paid off in banknotes readily convertible to a precious metal or gold exchange at the initial parity, thus reducing the exchange and credit risk and consequently the risk premium.

It is clear that the participating countries are divided into "core" and "peripheral" ones, according to their faithfulness to specie rules. The core countries (the UK, the US, France and Germany) almost always adhered strictly to the convertibility rule. They set the tune for the rest of the world; they led the system displaying hegemonic power, they were leading financial centres and world bankers and their national currencies were used as the "monetary anchor" for the other currencies.[3] By contrast, the peripheral countries (the developing European and non-European world, including Italy, Portugal, Spain, Belgium, Netherlands, Switzerland, the Scandinavian countries, Australia, Canada, Japan and the countries of Latin America) only temporarily maintained fixed exchange rates, to the extent that they wanted to rebuild or improve their credit-worthiness with international capital markets of the core countries. Whenever they faced imbalances in the external sector, they abandoned the rule.[4]

Greece as a peripheral country: typical features

Table 1 reviews briefly the historical episodes of adherence to and suspension of specie convertibility by Greece. There are three typical features placing Greece of the 19th century among peripheral countries. First, the exceptionally large number of alternations of periods of fixed and flexible exchange rates. From 1828, when, for the first time, a national monetary system was introduced (silver standard), to 1936, when the country entered the "sterling area", the Greek economy experienced eight episodes of suspension of gold or foreign exchange convertibility.

Second, the frequent alternations between metallic and paper currency standards, as well as the adoption of the prevailing international monetary system for a very short period of time reveal the governments' inability to maintain fixed exchange rates. The causes of the suspension of convertibility were not only the emergence of some sudden event, such as war, but governments' failure to pursue fiscal and monetary policies compatible with the country's commitment to ensure fixed rates.

3 Great Britain with the pound sterling in the gold standard, France with the franc in the Latin Monetary Union and the USA with the dollar in Bretton Woods. See Eichengreen (1990), Giovannini (1989), Bordo and Kydland (1995), Kindlerberger (1993).

4 There is abundant historical and empirical evidence on the operation of metallic monetary regimes in the 19th century and the early-20th century as a specie standard convertibility rule. Bordo and White (1991) provide historical evidence that Britain, unlike France, pursued a gold standard contingent rule during the Napoleonic Wars. It seems that such a policy was pursued not only by the "core" countries, such as France in the Franco-Prussian War of 1870-71 and America during the Civil War (Giovannini, 1993, Bordo and Schwartz, 1994), but also by the countries at the periphery of the system (Lazaretou, 1995).

Table 1

A chronology of episodes of adherence to, and suspension of, specie convertibility by Greece

Dates of convertibility resumption	Dates of suspension	Reasons for suspension	Change in the exchange rate
1. 1828 (silver monometallism)	June 1831	Government failure. Budget deficit difficulties.	
2. February 1833 (bimetallism)	April 1848	Response to a world-wide financial panic.	The drachma replaced the phoenix, gold-silver ratio (15.5:1).
3. December 1848 (bimetallism)	December 1868	War: the Crete Revolution.	The resumption was made at the original parity.
4. July 1870 (Latin Monetary Union)	June 1877	The Russo-Turkish War.	The resumption was made at the original parity.
5. January 1885 (gold standard)	September 1885	Economic crisis, government failure, war threat.	The resumption was made at the bimetallic drachma/French franc parity (1:1).
6. March 1910 (gold-exchange standard)	August 1919	Asia Minor Expedition.	The resumption was made at the original parity (1:1).
7. April 1928 (gold-exchange standard)	April 1932	World-wide monetary instability, debt repudiation.	Drachma's devaluation.
8. June 1933 (Gold Bloc)	September 1936	Gold Bloc dissolution, balance of payments deficits.	Drachma's devaluation.
9. October 1936 (sterling area)	December 1939	Imminence of World War II.	Drachma's devaluation.

Source: Lazaretou (1993, 1996), Alogoskoufis and Lazaretou (1997).

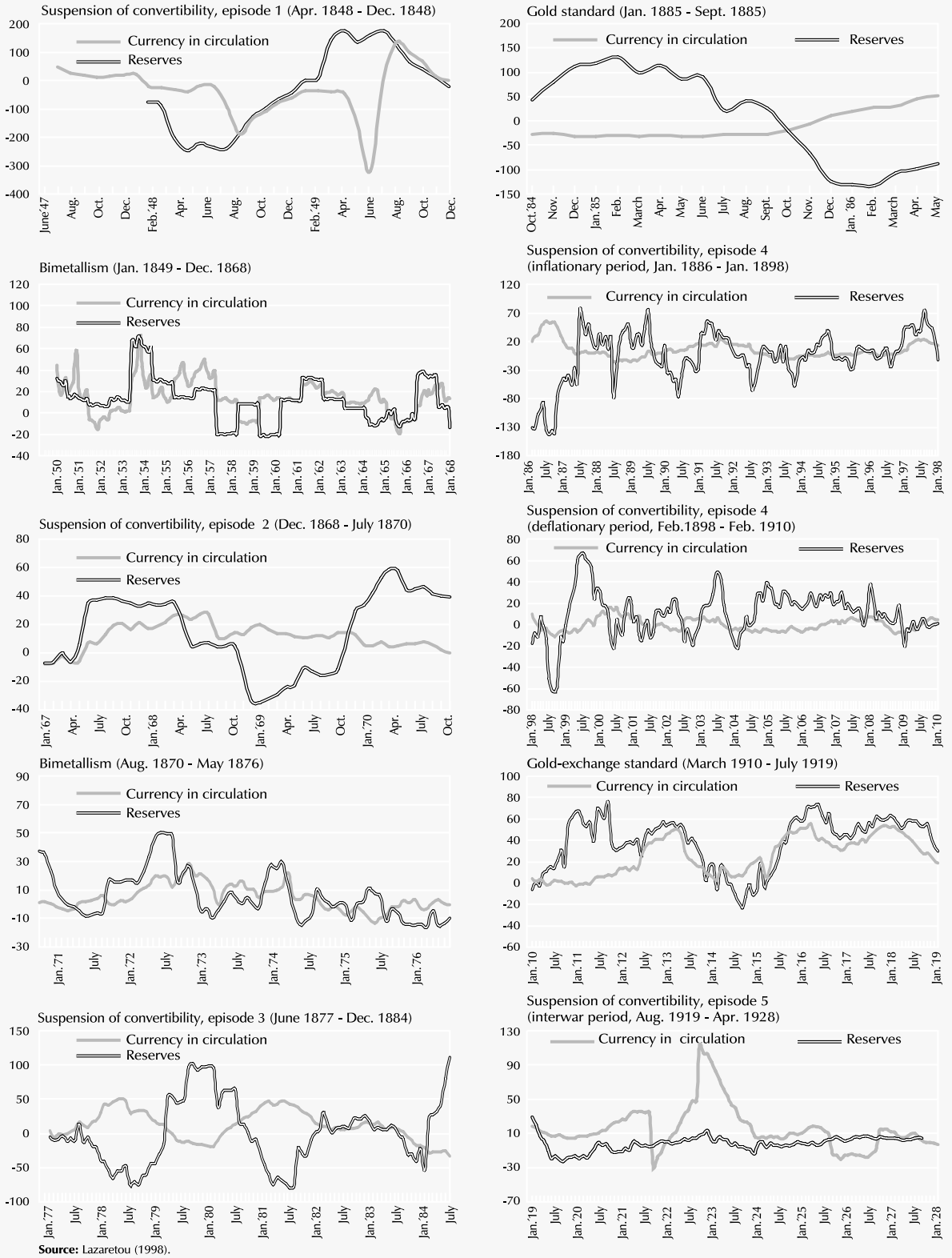
Third, the periodic abandonment of, and return to, metallic standards reveals, however, governments' strong commitment to the specie standard rule. Indeed, as seen in the following section, throughout the period under study the monetary authorities regarded the suspension of the drachma's convertibility into gold or foreign exchange as a reaction to an emergency, such as war.[5] Once hostilities ceased, they made efforts to return to the "natural state", realising that the pegging of the drachma, a weak currency, to the currency of the creditor country would considerably improve access to the international capital markets of the core countries.

3. The drachma, foreign creditors and the international monetary system

Based on the historical time series for monetary aggregates and historical experience, we attempt in this section, first, to explain Greek governments' insistence on tying the drachma to the

5 This perception is illustrated in the announcement of the then Governor of the National Bank of Greece, Efthimios Kehayias, to the General Meeting of Shareholders in 1883, at which time the country was trying to enter LMU: "The paper currency standard is a temporary and extraordinary measure, deemed necessary by the government only in exceptional political and economic circumstances, but having undesirable effects on transactions, particularly when banknote circulation increases above foreign exchange reserves, since this will cause a devaluation of the domestic currency" (National Bank of Greece, *Annual Report of the Governor*, 1884, p.9).

Chart 1
Currency in circulation and aggregate reserves (percentage change over twelve months)



Source: Lazaretou (1998).

international monetary system and, second, to interpret the timing of the transition from floating to fixed exchange rates. Chart 1 depicts the annual twelve-month rate of change in currency in circulation and total reserves in the various episodes of suspension of, and adherence to, the metallic convertibility of the drachma. We can count four examples where Greek governments made spirited efforts to pursue consistently a contingent gold standard rule, in an attempt to improve the country's creditworthiness.

First example

In December 1868 the government, in the face of the Crete Revolution, was forced to suspend bimetallic convertibility and issued paper money[6] to cover increased military spending. Inflation became the ultimate option for financing the war since the country was excluded from international capital markets and was also unable to draw funds through the domestic capital market.[7] However, when hostilities ceased in April 1869, the government announced its commitment to pursue an anti-inflationary policy so as to restrain liquidity in the economy and increase the foreign exchange reserves of the National Bank. In fact, from mid-1869 the growth rate of currency in circulation started to fall. Seigniorage revenues also fell, from 5.7 per cent and 8.3 per cent in 1868 and 1869, respectively, of total government expenditure, to just 0.01 per cent in 1870, whereas income tax revenues rose from 31 per cent in 1869 to 37 per cent in 1870. Efforts aimed at fiscal and monetary adjustment lasted 15 months and met with success. In July 1870, the drachma reverted back to bimetallism.

Two key factors urged the government to take anti-inflationary measures necessary to restore bimetallism. First, its insistence on the drachma entering LMU, to which it formally belonged since 1867, and, second, its intention to make reliable efforts for a final compromise on foreign outstanding debt.

Second example

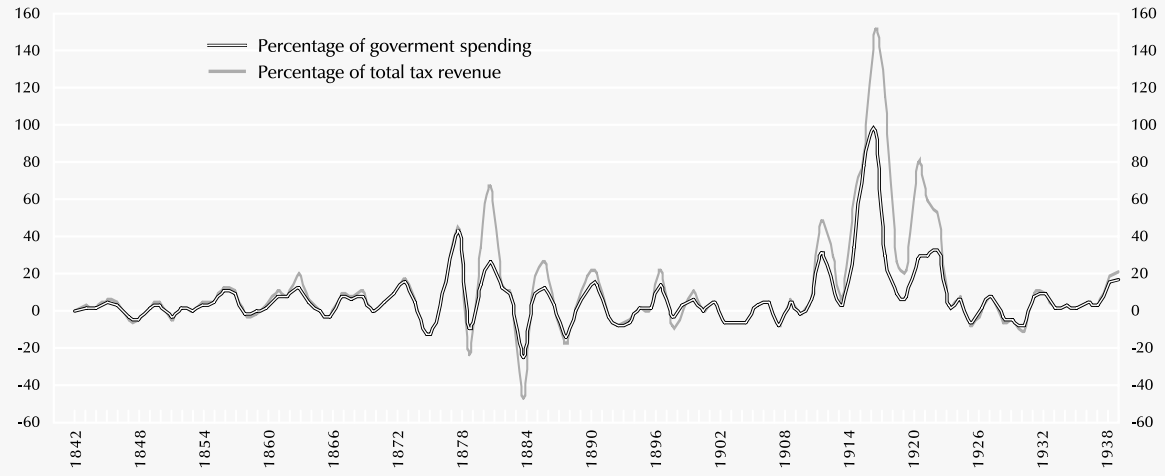
After a successful period of bimetallism that lasted almost seven years,[8] in June 1877 the government relied again on inflation as the ultimate

6 In effect, the government borrowed from the National Bank, which had the exclusive privilege of banknote issue, in metallic and banknotes at an interest rate of 1 per cent. The interest rate was low enough to cover the issuance expenses of fiat money. As seen in Chart 1, during bimetallism (1849-67) the growth rate of money in circulation was higher and more variable in relation to the subsequent period of flexible exchange rates (average annual growth rate: 4.6 per cent compared with 9.8 per cent, standard deviation: 14.2 per cent compared with 5.6 per cent). Nevertheless, this behaviour can be explained by the following factors: (i) high growth rates of banknotes in circulation reflect the increase in output and the increased money demand for transaction purposes, (ii) monetary expansion did not persist and (iii) the increase in currency in circulation was accompanied by a growth of foreign exchange reserves, so that the reserve/banknote ratio was not reduced below the statutory limit of 30 per cent.

7 The international capital markets of London and Paris were closed to Greece, since the country's reputation as a borrower was destroyed following Greece's inability to repay the Independence loans of 1824-25 and the default in 1843 on the loan of 1832. Despite protracted efforts to settle the debt and the establishment of an international committee for Greek debt management and the conduct of domestic economic policy, the definitive compromise with foreign creditors came only in 1879. Meanwhile the government asked the National Bank to cover the pressing finance requirements. The Bank lent the government short-term capital, setting very high risk premiums (an interest rate of 7-8 per cent, i.e. the interest rate of commercial discounts, while the interest rate in the international capital markets was 2.5-4.5 per cent). High interest rates allowed the Bank to attract not only domestic savings but also capital from abroad (usually form Greek emigrants), offering higher yields (3-6 per cent).

8 During this period, foreign creditors seemed extremely willing to hold Greek bonds. In 1872, the government successfully issued Treasury bills at the attractive interest rate of 8 per cent, causing competition between commercial banks and the State (the interest rate on time deposits was 6-6.5 per cent). In 1874 it signed a contract with the National Bank for a bond loan issue at the interest rate of 9.6 per cent for the repayment of all its previous debts to the Bank.

Chart 2
Seigniorage, 1842 - 1939



Note: Seigniorage is calculated as the ratio of the change in the monetary base to total tax revenues or total government spending.Total tax revenue is total ordinary revenue from direct and indirect taxation, while government spending regards central government expenditure, including interest payments.

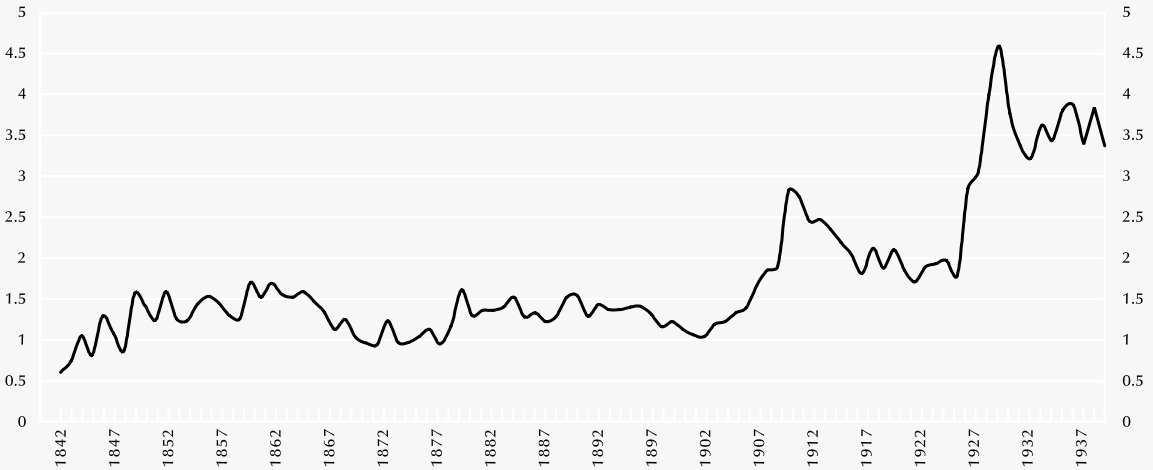
Source: Lazaretou (1998).

instrument to meet its urgent borrowing requirements due to new wartime emergencies (the Russo-Turkish War of 1877-78)[9] (see Chart 2). Nevertheless, after the end of the war in 1878, it tried to bring the drachma back to the "natural state", namely bimetallism. To this end, it took anti-inflationary policy measures and it attempted to contract a loan, albeit unsuccessfully, with foreign creditors. The government's decision was prompted mainly by its interest in successfully concluding its negotiations with foreign creditors for the Independence loans, which had been going on since 1878. Effective monetary adjustment was translated into a successful debt settlement. From June 1879 Greek government bonds were accepted again in the London Stock market and large gold inflows occurred (see Table 2). Public confidence in the domestic currency was promoted (see Chart 3). In a state of euphoria, in May 1880 the government announced the precise date for specie payments resumption (1st January 1881). However, reversion to bimetallism on the specified date failed. The anti-inflationary policy efforts stopped in October 1880, when a new crisis broke out in Greek-Turkish relations, resulting in increased wartime expenditure. Once the crisis passed, the government, willed on its intention to return to fixed exchange rates, took, for a second time, anti-inflationary policy measures.[10] Specifically, it reduced seigniorage and raised taxation in an effort to resume specie payments at the original parity. Moreover, in November 1882 it devalued the drachma so that the drachma/French

9 With the intention of maintaining bimetallism in view of the war, the government issued a national loan in December 1876 and short-term securities in the form of Treasury bills in March 1877. Nevertheless, loans were covered only partly, mainly because of the inadequacy of domestic savings.

10 As illustrated in Chart 1, during the episodes of convertibility suspension currency in circulation was negatively related to reserves and, as a result, the reserve/banknote ratio was reduced. By contrast, this relation became positive in the periods of fixed exchange rates and thus the reserve/banknote ratio remained stable at the limit set.

Chart 3
Money multiplier, 1842 - 1939



Note: The term "money multiplier" is defined as the ratio of the money stock to the monetary base. It is an index which reflects the confidence of the public in the banking system. If this index records high values, the confidence of the public to the banking system is increased, since a larger part of liquid assets is held by banks.

Source: Lazaretou (1998).

franc parity became 1:1, as laid down in the LMU agreement. This time the effort was successful. In January 1885, the drachma joined the gold standard at the statutory par, after a 7-year delay period had passed.

It should be noted that the timing of the transition from an irredeemable paper currency standard to the gold standard can be interpreted by two factors. First, from the beginning of the 1880s all the developed world of the time was already on gold. So, this fact would probably be a good reason for joining. And, second, following the debt compromise on its foreign debt, which came at last in 1879, the country could again draw funds on favourable terms from the capital markets of the core countries. However, this could be done only to the degree that foreign lenders ascertained that governments actually pursued prudent monetary and fiscal policies, aimed at linking the drachma to the international gold standard. And this because the restoration of the gold convertibility rule was a precondition of lending and would signal to foreign creditors that the debtor would follow an economic policy compatible with keeping the drachma/franc parity fixed at 1:1. In this way, the possibility of either a unilateral suspension of debt service or of servicing it in a devalued currency would be averted.

Third example

The government budget that was already showing a deficit, due to the economic recession since the end of 1884, forced the government, in September 1885, to suspend drachma convertibility in view of a new war threat. Foreign borrowing, however, mainly financed the increased wartime spending. Indeed, seigniorage never rose above 14 per cent of total expenditure, while, on average, it was only 3 per cent in 1886-97, compared with 11 per cent in 1877-84 (see Chart 2).

Table 2

Greece's domestic and foreign loans during the 19th and at the beginning of the 20th century

a. Domestic loans

Year	Loan	Interest rate, maturity	
1872	Issuance of Treasury bills	8 per cent	The National Bank of Greece was the main purchaser. Treasury bills were discounted at commercial discount rates.
1874	26 million drachmas	9.5 per cent	Bond loan was issued for the repayment of previous government debts to the National Bank of Greece. In 1880 the government suspended amortisation payments and reduced the interest rate to 5 per cent. Bonds were issued at par value in drachmas but they were repaid in depreciated drachmas.
1876	10 million drachmas	8 per cent	National loan was used for financing excess defence spending (partially covered). In 1888 the government suspended amortisation payments and reduced the interest rate to 5 per cent. The loan was repaid in depreciated drachmas.
1877	9 million FF	8 per cent	Issuance of Treasury bills. Failure.
1882	17.8 million drachmas	6.75 per cent	Road construction loan. In 1889 the government suspended amortisation payments and cut the interest rate to 5.5 per cent.
1884	9 million drachmas	7 per cent	In 1889 the government suspended amortisation payments and reduced the interest rate to 5.5 per cent.
1885	3 million drachmas		Discounting of Treasury bills by the National Bank of Greece.
1886	19 million gold FF	2 years	Loan in gold contracted with a consortium of banks (the National Bank of Greece, the Bank of Epirus and Thessaly, the Bank of Industrial Credit and the Bank of Konstantinople) for interest and amortisation payments on the outstanding external debt.
1887	15 million drachmas	4 per cent	Loan contracted with the National Bank of Greece for the repayment of various temporary loans. It was repaid in depreciated drachmas.
	10.2 million gold FF		Loan contracted in gold with a consortium of banks (the National Bank of Greece, the Bank of Epirus and Thessaly, the Bank of Industrial Credit and the Bank of Konstantinople) for interest and amortisation payments on the outstanding external debt.
1892	16.5 million drachmas	18 months, at 4 per cent	In 1893 the government converted the gold loan (interest and amortisation payments) into bonds at the then valid parity and thus interest rates and capital were reduced by 40 per cent. As a consequence, the bond price fell to 313 FF from 500 FF.
1898	76.3 million drachmas	80 years, at 5 per cent	Issuance of a new bond loan for the repayment of previous debts. Bonds of previous loans were converted into new ones and could be purchased in the domestic money market.
1900	11.7 million drachmas	5 per cent	Amortisation bond loan. Success.
1907	10 million drachmas	30 years, at 5 per cent	Thessalian agricultural loan. The loan was contracted with a consortium of banks for the purchase of land and the housing of refugees.
1910	5 million drachmas	5 per cent	
1912	40 million drachmas	6 months	Temporary loan.
1913	50 million drachmas		New temporary loan.
	40 million drachmas	5 months, at 5 per cent	Bond loan.
1914	65 million drachmas		A foreign bond loan, contracted in 1915 and amounting to 335 million gold FF, was used to repay the loan.
1915	40 million drachmas	5 years, at 6 per cent	Temporary loan.
	15 million gold FF	15 years, at 6 per cent	Long-term loan.
1917	100 million drachmas	20 years, at 6 per cent	Long-term requisition loan.
	25 million drachmas	5.5 per cent	Temporary loans.
	10 million drachmas	6 per cent	
	5 million drachmas	6 per cent	

Table 2 *(continued)*

Year	Loan	Interest rate, maturity	
1918	83.7 million drachmas	3 months, at 4 per cent 6 months, at 5 per cent 1 year, at 5.5 per cent	Treasury bills of "National Defence". Foreign markets were reluctant to lend to Greece.
	75 million drachmas	30 years, at 6 per cent	Long-term loan for financing previous budget deficits.
1919	300 million drachmas	5 per cent	Lottery loan.
	338.2 million drachmas		Treasury bills of "National Defence".
1920	41 million drachmas	6 per cent	Treasury bills of "National Defence".
	$200 million	5.5 per cent	Temporary loan by the National Bank of Greece.
	12 million drachmas	6 per cent	New temporary loan.
	300 million drachmas	5 per cent	Domestic lottery loan.
1921	119 million drachmas	6 per cent	Treasury bills of "National Defence".
	125 million drachmas	5 years, at 6 per cent	Temporary loans by the National Bank of Greece.
	150 million drachmas	1 year, at 6 per cent	
	75 million drachmas	5 years, at 6 per cent	
	40 million FF	6 per cent	
1922	21 million drachmas	6 per cent	Treasury bills of "National Defence".
	1.3 billion drachmas	20 years, at 6.5 per cent	Forced loan. 50 per cent of the value of the banknote was exchanged for Greek Treasury bills of equal value.
1923	603 million drachmas	6 per cent	Treasury bills of "National Defence". The regular repayment of Treasury bills by the National Bank of Greece improved the country's solvency, thereby attracting inactive provincial capital.
1924	50 million drachmas	10 years, at 6 per cent	
	648 million drachmas	10 years, at 6 per cent	Loan for consolidating previous Temporary loans by the National Bank of Greece and for the repayment of short-term Treasury bills.
1926	1.25 billion drachmas	20 years, at 6 per cent	Forced loan. 25 per cent of the value of the banknote was exchanged for Greek Treasury bills of equal value.
	750 million drachmas	10 years, at 8 per cent	Loan for the conversion of 50 per cent of the outstanding Treasury bills of "National Defence".
1927	800 million drachmas	8 per cent	Loan of Greek citizens.
1928	1.65 billion drachmas	6 per cent	Loan for the exchange of populations.
	800 million drachmas	6 per cent	Loan for Greek- Bulgarian migration.
1929	700 million drachmas	6 per cent	Loan for war victims.

Note: The domestic debt was granted almost entirely by the National Bank of Greece. Private creditors, such as universities, pension funds and charities held only a small fraction of the debt. The low creditworthiness of the country, the risk implied by the long-lasting exchange-rate volatility, and the small size of the domestic money market (the only market in which bonds could be traded, as they could not be cashed in metallic currency) prevented the trading of bonds on the stock exchange for a long period of time. Almost all bonds remained immobilised in the portfolio of the National Bank of Greece.
Source: National Bank of Greece, *Annual Report* (various issues) and Bank of Greece, *Monthly Statistical Bulletin* (various issues).

b. Foreign loans

Year	Loan	Interest rate, maturity	
1824	£0.8 million	36 years, at 5 per cent	Successful issuance: Sign of sympathy to Greece.
1825	£2 million	6 per cent	Bond speculation on London Stock Exchange.
1826	Debt repudiation		Unilateral suspension of loan servicing payments.
1832	60 million drachmas	36 years, at 5 per cent	"Gesture of goodwill" by the Protecting Forces in view of the advent of the monarchy.

Table 2 *(continued)*

Year	Loan	Interest rate, maturity	
1843	Debt repudiation		Unilateral suspension of servicing of the 1832 loan.
1856	Imposition of international financial control		Non-recognition of the loan by the Greek monarchy.
1864	Debt compromise		Final settlement of the 1832 loan.
1879	60 million gold FF	40 years, at 6 per cent	Final settlement of the 1824-25 loans.
	£1.2 million	33 years, at 5 per cent	
1880	60 million gold FF	6 per cent	The National Bank of Greece contracted a foreign lottery loan in metallic currency, at a high interest rate, on behalf of the Greek State.
	120 million gold FF	40 years, at 5 per cent	
1883	10 million gold FF		
1884	170 million gold FF	37.5 years, at 5 per cent	
1887	91 million gold FF	75 years, at 4 per cent	
1889	111 million gold FF	4 per cent	
1890	80 million gold FF	99 years, at 5 per cent	International monetary turmoil. The loan was partially covered (53 million drachmas). The credit standing of the Greek State decreased.
1892	Foreign markets' distrust of Greek State		Mr. Law (economic attaché of the English embassy) and Mr. Roux (economic attaché of the French embassy) made a report on the Greek economic situation. They were fully supported by the Greek government, which envisaged the agreement on a new foreign loan.
1893	Debt repudiation		The Law report, which depicted favourably the Greek economy, was published, whereas the Roux report, which pointed out to the loss of the Greek State's solvency, was never published. The government was unable to contract a new foreign loan. Unilateral refusal to pay amortisation. Repayment (in gold) of only 30 per cent of the interest on due foreign loans, as well as repayment (in banknotes) of 50 per cent of due interest.
1894	Negotiations		Deadlock. Unsuccessful effort to issue a capitalisation loan (interest coupons falling due would be paid off by means of bonds).
1895-96	New negotiations		
1898	Debt compromise 150 million gold FF	2.5 per cent	The system of tax collection and management was audited by creditors.
1902	44 million drachmas	4 per cent	
1906	20 million gold FF	36 years	
1907	20 million drachmas	5 per cent	
1910	110 million gold FF	50 years, at 4 per cent	
1914	335 million gold FF	50 years, at 5 per cent	
1918	850 million gold FF		Credit that the Allied Powers agreed to extend after the end of the war. In the meantime, the country should issue paper money of equal value. However, these credits were not actually released, and thus severe exchange rate fluctuations occurred.
1924	£10 million	40 years, at 7 per cent	Refugee loan.
1927	£9 million	30 years, at 6 per cent	Stabilisation loan.
1928	£4 million	6 per cent	Public works loan.
1932	Debt repudiation		Unilateral suspension of amortisation payments for the external debt.
1935	Debt compromise		World War II suspended all payments.

Source: National Bank of Greece, *Annual Report* (various issues) and Bank of Greece, *Monthly Statistical Bulletin* (various issues).

It was the time when governments raised foreign loans on favourable terms for the implementation of infrastructure projects. After averting the economic crisis of 1884-85 and contracting a large foreign loan in 1887, Greece improved its solvency in international capital markets. From 1889 onwards, foreign creditors willingly provided the government with loans without pledges and at an interest rate lower than 5.5 per cent. This happened because they considered that the suspension of drachma convertibility in September 1885 was temporary and attributable to an emergency. They thus expected that the government would soon adopt anti-inflationary policy measures, as it had done in the past, in an effort to resume specie payments once the effects of the urgent contingency had passed.

However, higher government expenditure, mainly expenditure on the repayment of domestic debt, and its financing through foreign borrowing caused higher interest payments, thus contributing to persistent budget deficits that prevented the return to the gold standard. In 1890 the country's reputation as a borrower began to suffer. The then forthcoming debt default of Portugal in Europe and the dollar crisis on the other side of the Atlantic alarmed foreign creditors, who until then provided developing countries with large loans without pledges and at low interest rates. At the same time, due to the unsustainability of public debt, the country soon became over-indebted. In 1892 the government tried, without however meeting with success, to contract a foreign loan, while in December 1893 it unilaterally suspended payments on servicing the debt. The country's credibility had been destroyed and foreign investors, in an effort to renegotiate the debt, demanded the permanent presence of foreign experts for the control of economic policy and mainly of tax revenue collection and management systems. The establishment of the international committee for Greek debt management was regarded by creditors as a sufficient condition for governments to pursue monetary and fiscal policies that would secure both the regular repayment of the accumulated foreign debt as well as the payment in drachmas convertible to gold at the initial parity (1:1).

Following a 10-year period of fiscal and monetary adjustment and gradual restoration of public confidence in the currency (see Chart 3), Greece succeeded in becoming a full member of LMU in 1910. The country's creditworthiness was rebuilt, resulting in the successful coverage (about 60 per cent) of the huge military expenditures of the Balkan Wars I and II by foreign borrowing, without disturbing the fixed exchange rate of the drachma against the French franc. A sign of the country's solvency was also the fact that the price of government bonds traded on the London Stock Exchange started to rise after 1910, reaching 60-70 pounds sterling, the highest price ever recorded.

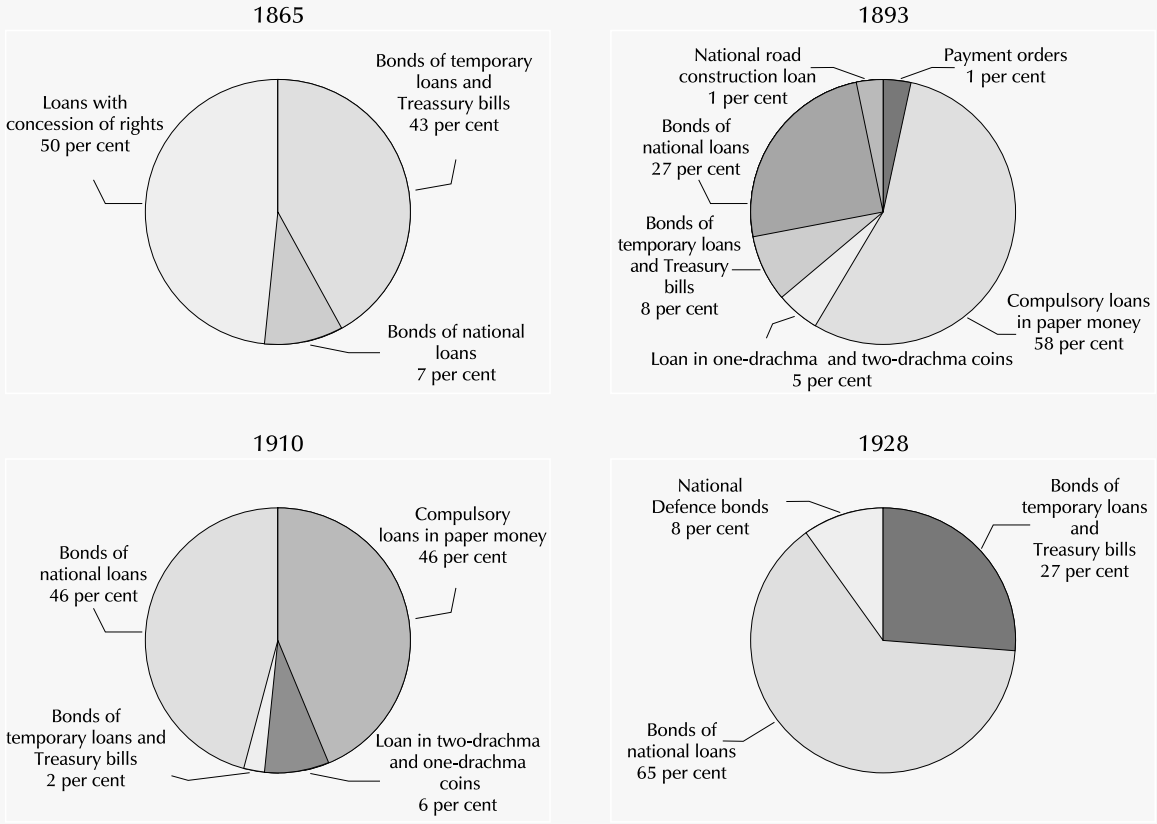
Fourth example

After a long wartime period (1917-22) marked by unprecedented political and social upheavals, monetary expansion, uncontrolled inflation and wide fluctuations in drachma exchange rates, Greece tried anew from the mid-1920s to follow international monetary developments.

In the Annual Report for the year 1926, the then Governor of the National Bank Alexandros Diomides regarded monetary consolidation, pursued not through a revaluation but by bringing the

Chart 4

Breakdown of Greek public debt to the National Bank of Greece



Source: Lazaretou (1998).

value of the domestic currency to the market level, as a prerequisite for foreign capital inflow. And he pointed out the benefits of monetary stability stipulated by law: "Restored...confidence in the domestic currency will not only repatriate capital from abroad allowing it to be invested in drachma-denominated securities, subdued today, but also importantly will remove all psychological barriers to the smooth transfer of capital across markets, thereby automatically restoring a balance. Such capital will be attracted to where there will be more profitable use, temporary or permanent, it will cover budget deficits, it will greatly contribute to reducing the interest rate, bringing it down to lower levels, close to those prevailing abroad. In this way, business activity, slackening today as it lacks cheap capital, will easily find the means to be promoted and perform in terms advantageous for the entire economy. Then, the benefit for the government will be secured through the automatic increase in tax yields due to the enrichment of the various banks from which it draws its proceeds" (National Bank of Greece, *Annual Report* of the Governor for the year 1926, 1927, pp. xxv-xxvi).

When hostilities with Turkey ended with the ratification of the Treaty of Lausanne (July 1923), the

Table 3
Assessment of Greece's creditworthiness

Before 1879	Greece was unable to have access to international capital markets. A short-term domestic debt was issued at a very high rate (8 per cent).
1879	Greece rebuilt its reputation in the international capital markets after a debt compromise was reached for previous foreign loans.
1880-84	Efforts for the drachma to join Latin Monetary Union. Long-term foreign borrowing from the money markets of Western Europe on favourable terms (5 per cent). Improvement of borrowing terms in the domestic money market: the interest rate was cut to 6-7 per cent and loan maturities were extended.
1886-89	Foreign investors' expectations that the drachma would return to the gold standard. Borrowing from abroad at a low interest rate (4 per cent), with a small or no guarantee.
1890-97	Greece's creditworthiness tottered. Foreign creditors were unwilling to lend the country.
1898	Debt renegotiation. Successful implementation of a long-term stabilisation programme with the assistance of foreign creditors.
1899-1909	Borrowing from abroad at a low interest rate (4 per cent). Bonds of domestic loans became tradable in the domestic money market. Bond lottery at par value.
1910-14	Greece's creditworthiness improved. Possibility to borrow from abroad, owing to a war emergency, at a low rate (4-5 per cent).
1915-22	International capital markets were unwilling to lend Greece, owing to the wartime turmoil, the post-war political and monetary instability in the country, and the pendency of Greece's national defence debts. As of 1920, unwillingness of the domestic market as well to grant loans to the Greek government. Continuous issuance of short-term Treasury bills (at 6 per cent), short-term loans from the National Bank of Greece, and money issuance.
1923-25	End of the war. Fiscal adjustment and short-term domestic debt stabilisation efforts. The country's creditworthiness improved. Conclusion of a new foreign loan (at 7 per cent).
1926-27	Stabilisation programme. The country rebuilt its reputation. Agreement on a new foreign loan at a low rate (6 per cent), conditional upon the drachma's entry in the international monetary system and the imposition of fiscal discipline.

government made efforts to achieve fiscal and monetary adjustment. Thus, it avoided using inflation as a financial instrument, but tried to cover spending through taxation. In addition, it successfully sought to contract a foreign loan (the 1924 Refugee Loan). In the aftermath of the Asia Minor Disaster, the country lost its credibility in international capital markets. The price of Greek bonds in the London Stock Exchange approached the very low level of 20-21 pounds sterling and the interest rate soared to 25 per cent. However, from 1923 onwards, the country's creditworthiness started to recover. The price of government bonds gradually increased, reaching in 1923 50-55 pounds and 65 pounds in 1924, implying a remuneration at a rate approaching the yields on foreign securities (8.5-9 per cent).

In 1926, the government turned again to international capital markets of Western Europe and America to draw the requisite resources to meet pressing needs for the relief of refugees and the country's rearmament. Creditor countries agreed to provide, in 1927, a tripartite 9 million loan in pound sterling. For the disbursement of the loan, however, they required the Greek government to follow a strict consolidation programme,[11] aiming

11 The negotiations for a loan agreement often resulted in an impasse. This was because foreign creditors demanded, according to the treaty of Genoa in 1922, the establishment, six months after the loan issue, of a new central bank, which would guarantee with its policy the smooth functioning of the monetary and credit system. As is known, by May 1928, when the Bank of Greece was inaugurated as an official body for the conduct of monetary policy, the National Bank had the sole privilege of note issuance. It operated as a commercial bank as well and thus its commercial considerations distracted it from its public duties.

at the drachma's participation in the international monetary system of the interwar gold-exchange standard. The adjustment period lasted almost two years and was completed successfully. In May 1928, the drachma was pegged to the pound sterling, after having devalued first, while at the same time the disbursement of the loan began.

The structure of domestic debt at various times, as well as the fluctuations in the country's creditworthiness (namely, access to or exclusion from international money markets, changes in lending rates and the maturity of the loan, and provision of guarantees) may provide some evidence on the development of the country's reputation as a debtor. Chart 4 depicts debt composition at four different points in time (the public's liabilities to the National Bank are used as a proxy for domestic debt): in 1865, when the drachma belonged to bimetallism; in 1893, when Greece was in default in its foreign debt; in 1910, when the drachma entered LMU; and in 1928, when the drachma joined the interwar gold standard. We observe that whenever the government made successful anti-inflationary efforts, aiming at the restoration of the convertibility rule, a percentage equal to or larger than 50 per cent of total debt corresponded to long-term borrowing. It is worth-noting that government bonds corresponded to 46 per cent and 65 per cent, respectively, in 1920 and in 1928, while short-term debt (Treasury bills and temporary loans) corresponded only to 2 per cent in 1910 and 27 per cent in 1928. As can be seen in Table 3, each time the government announced its intention of maintaining a fixed-rate regime, the country could draw funds from the domestic and the foreign capital markets on favourable terms.

4. Conclusions

In this paper, we have tried to explain why Greek governments in the 19th and the early 20th century strongly insisted on the participation of the drachma in the prevailing international monetary system. Two basic conclusions are easily deduced from the analysis. First, Greek governments might follow a "contingent gold standard rule". In case of an emergency, such as war, the government temporarily relied upon inflation to cover excess spending. Once the hostilities ceased, it pursued an anti-inflationary policy so as to revert to the "natural state", namely the convertibility of the drachma into a precious metal or foreign exchange at some future date. Both the historical evidence and the historical time series of the fundamental monetary aggregates for the Greek economy seem to confirm this explanation.

Second, governments consistently adhered to the gold standard rule, realising that the participation of a peripheral, developing country with a weak currency in a monetary zone of strong economies was beneficial not only in terms of monetary and exchange rate stability,[12] but it also improved significantly the country's creditworthiness. Thus, each time governments needed foreign capital to finance their excess spending, they made credible efforts to achieve fiscal consolidation and monetary discipline, with a view to enhancing the country's reputation in international capital markets of Western Europe and the USA. On the other hand, foreign investors were willing to lend the government only when it credibly committed itself to the

12 For an empirical investigation of these benefits, see Lazaretou (1998).

drachma participation in the international monetary system, since adherence to the convertibility rule would ensure that the debt would ultimately be repaid in a currency readily redeemable into a precious metal or foreign exchange at the initial parity. In this way, risk premiums and, consequently, lending rates were much reduced.

Typical examples in which foreign loan agreements had to be accompanied by efforts of entry into a fixed-rate regime were: (a) the introduction of Greek government bonds into the London Stock Exchange, following the debt compromise in 1879 (in 1885 the drachma was linked to the gold standard); (b) the efforts of Greek governments to rebuild the country's credibility in international capital markets following the debt default in 1893, with the acceptance, on behalf of the Greek government, of the presence of a committee of international experts for the monitoring of the economic policy pursued (in 1910 the drachma joined LMU); and (c) the successful agreement of a large foreign loan in 1927 on condition that the drachma would participate in the interwar gold-exchange standard.

Data sources

The time series for the money supply, monetary base, currency in circulation, seigniorage, total reserves (in foreign exchange and in metallic currency) and government liabilities to the National Bank are derived from Lazaretou (1998) and refer to the end of each month or year.

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The causality between government spending and government revenue in Greece[1]

George B. Hondroyiannis
Economic Research Department

1. Introduction

The existence of a dynamic relationship between government spending and government revenue has been investigated and discussed by many economists, especially during the past decade. Such an investigation would be very useful, given that in the last thirty years we have witnessed a significant expansion of the public sector in all developed countries, and several central as well as local governments have had increased deficits, at least until the early 1990s. The causality between government revenue and spending has therefore concerned economists on theoretical and empirical grounds. The definition of this causality is of great economic interest, since these two variables determine the government budget deficit. It is thus obvious that full understanding of this causality will help to understand and explain the large fiscal deficits and will at the same time provide an opportunity to study and analyse the effects of fiscal policies pursued.

In the literature, there are three distinct views on the dynamic relationship between government revenue and spending. The proponents of the first view argue that, owing to externalities or imbalances in the economic system, policy makers determine first the size of government spending and then the level of tax revenue necessary to finance it (spend and tax hypothesis). According to the second view, it is revenue that determines government spending (tax and spend hypothesis). The underlying economic logic is that fiscal

1 The views expressed in this article are those of the author and not necessarily those of the Bank of Greece. The author wishes to thank Professor Vassilis Droukopoulos (member of the Monetary Policy Council) and Heather Gibson for their valuable comments.

authorities are first and foremost interested in specifying revenue, since its size determines the extent of feasible spending. Finally, according to the third view, the causal relationship between the two variables works in both directions.

Many researchers, using time series for different countries and periods, have tested empirically the hypothesis of a causal relationship between the two variables. The results of these studies are mixed; none of the above theories can therefore receive firm support. For example, Anderson, Wallace and Warner (1986), Von Furstenberg, Green and Jeong (1986), Provopoulos and Zambaras (1991), Kollias and Makrydakis (1995), Hondroyiannis and Papapetrou (1996) and Dahlberg and Johansson (1998) argue that changes in government spending determine changes in government revenue, while Manage and Marlow (1986), Blackley (1986) and Ram (1988a) see government revenue as an exogenous variable which determines the size of government spending. Finally, other researchers, such as Ram (1988b) and Koren and Sytiassny (1998), derived different results across the countries they studied, while Bohn (1991) established, in some cases, the absence altogether of a causal relationship between the two variables.

The aim of the present paper is the empirical study of causality between government revenue and spending in Greece, taking into account all fiscal developments, since it is well known that in the past few years considerable efforts towards fiscal discipline have been made, in order to meet the fiscal criteria of the Maastricht Treaty. These efforts have led to an improvement in all the fiscal aggregates of the Greek economy. Since 1993, these aggregates have moved in line with the convergence programmes of the Greek economy, which are chiefly aimed at reducing the ratios of government net deficit and debt to GDP by containing primary expenditure under the ordinary budget and by expanding the tax base.

The fiscal aggregates used in this paper have been calculated as percentages of GDP on an accrual basis, according to the European System of Accounts (ESA), and refer to the period 1960-1997. We initially test the hypothesis of a long-run relationship between government revenue and spending as percentages of the GDP, using cointegration analysis as suggested by Johansen and Juselius (1990,1992).[2]

After estimating the cointegrating equation, we define the long-run equilibrium relation. The deviations from this equilibrium, represented by the residuals of the cointegration vector, are included in the vector error-correction models (VECMs) to capture the responses of the two variables to disequilibrium. Finally, we detect Granger causality between government revenue and spending as percentages of GDP through the VECMs derived from the long-run cointegration vectors (Granger 1986, 1988).

The study consists of five sections. Section 2 provides a review of recent fiscal developments; Section 3 examines the link between spending and revenue, both theoretically and empirically. Section 4 reports the empirical results, while the

2 The existence of a long-run relationship can only be tested when the time series are of the same order of integration. For this reason, we used the methods developed by ADF (Dickey-Fuller, 1979), PP (Phillips-Perron, 1988) and KPSS (Kwiatkowski *et al*., 1992) to test the stationarity properties and the order of integration of the statistical series used in the empirical analysis.

methodology used in the empirical analysis is presented in the Appendix. Finally, Section 5 provides a summary and concluding remarks.

2. Review of fiscal developments in Greece

During the 1960s, the Greek economy witnessed high growth rates, with normal levels of government deficits and debt. By contrast, after 1974, the main features of the Greek economy were weak growth rates, high government spending-to-GDP ratios compared with the pre-1974 period (1960: 21.8 per cent, 1970: 26.5 per cent, 1980: 31.8 per cent, 1990: 48.2 per cent, 1997: 42.9 per cent), high inflation (1960: 1.7 per cent, 1970: 2.9 per cent, 1980: 24.8 per cent, 1990: 20.4 per cent, 1997: 5.5 per cent) and high general government deficit-to-GDP ratios (1960: –0.3 per cent, 1970: –0.7 per cent, 1980: 2.6 per cent, 1990: 16.1 per cent, 1997: 4.0 per cent). It should be noted that, in the post-1974 period, government spending rose significantly but did not exceed the average in the European Union countries. On the other hand, government revenue fell far short of the European Union average, leading to a growing government deficit which, as a percentage of GDP, was the highest among European Union countries.

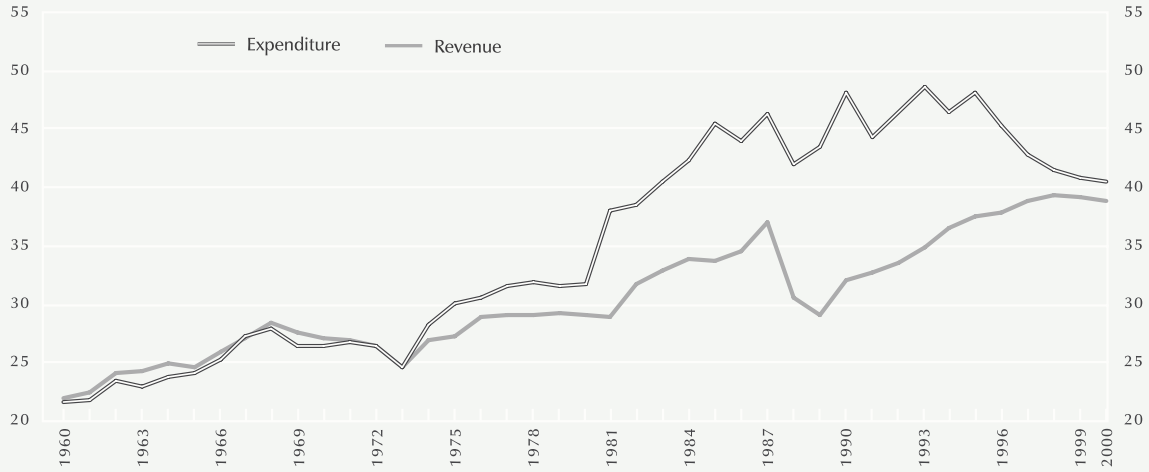
In particular, the total spending of general government, as defined in the Maastricht Treaty, rose from 21.8 per cent of GDP in 1960 to 27.2 per cent of GDP in 1974 and 48.8 per cent in 1993, before starting to decline (after 1993) as part of the effort to eliminate fiscal imbalances. Thus, in 1997, general government spending was reduced to 42.9 per cent of GDP and, according to the convergence programme, is expected to decline further in 2000, to 40.5 per cent of GDP.

Over the same period, the total revenue of general government, as a percentage of GDP, increased at a slower pace (1960: 22.0 per cent, 1970: 26.5 per cent, 1980: 31.8 per cent, 1990: 32.1 per cent, 1997: 38.9 per cent) and declined significantly in 1988 and 1989. Chart 1 (next page) shows the evolution of government revenue and spending as percentages of GDP from 1960 to 2000.

As suggested by Chart 1, in the period before 1974, government spending and revenue, as percentages of GDP, were roughly equivalent, thus the fiscal deficit was small. After 1974 however, government spending was significantly higher than revenue. As a result, the gap between total revenue and total expenditures grew, especially after 1980, and peaked in the 1988-1990 period, reflecting an acceleration of the growth rate of government spending and a drop in government revenue. This unfavourable development was mainly due to the frequent national elections and the expansionary fiscal policies pursued during that period, which led to an overdeveloped public sector and large fiscal deficits.

The 1991-1993 stabilisation programme and the first convergence programme of the Greek economy (1993-1998) and then the revised stabilisation convergence programme (1994-1999) and the updated convergence programme (1998-2001) resulted initially in a slowdown and subsequently in a significant reduction in government spending, along with an increase in government revenue. The decline in spending was mainly due to lower interest payments and, to a lesser extent, to the containment of primary expenditure under the ordinary budget. In 1997, a framework for the rationalisation and monitoring of government spending was established, especially for those

Chart 1
Revenue and expenditure of general government as percentages of GDP in Greece, 1960-2000[1]



1 Values for 1998 are based on estimates.
Values after 1998 are based on projections of the revised convergence programme.

Source: Ministry of National Economy.

entities that are funded through the government budget but do not follow the government accounting system. This was necessary because the government budget was drawn up using the "additive" method, whereby annual budgeted spending was determined on the basis of the actual expenditure of the previous year plus an increment in proportion to expected inflation and growth rates, also taking account of the financing requirements of general government (ministries, public entities etc.), without, however, any efficiency considerations.

The increase in revenue during that period reflected largely the broadening of the tax base, the introduction of new taxes, a crackdown on tax evasion and, to some extent, a more equitable allocation of the tax burden. Specifically, with the tax reforms in recent years, the taxable income of the various categories of taxpayers, including farmers, is calculated on the basis of certain objective criteria related to type and location of activity. Also, the rate of withholding tax was raised for all taxpayer categories (wage earners, pensioners, professionals and corporations) and several tax breaks and exemptions were abolished. At the same time, all citizens aged at least 25 were obliged to file an income tax return irrespective of their occupation. Moreover, the corporate tax rate was increased and new taxes were imposed on large real estate, holdings of government securities, stock market transactions, the previously tax-exempt part of banks' and corporations' reserves, and cellular telephones. In the past few years, road duties, stamp duties, and special consumption taxes on tobacco, alcoholic beverages and fuels have all increased. The special consumption tax on fuels was cut in 1997 and 1998, and VAT on electricity as from 1 January 1999, while, for the first time since 1992, taxable income brackets were indexed to inflation, effective from financial year 1997.

The outcome of the fiscal policy pursued in recent years was that the net deficit of general government fell from 16.1 per cent of GDP in 1990 to 2.4 per cent of GDP in 1998 and is projected to further decline to 1.9 per cent of GDP in 1999 and to 1.7 per cent in 2000.

3. Theoretical and empirical approach to the relationship between government spending and revenue

According to traditional Public Finance theory, in formulating fiscal policy —that is, in drawing up the government budget— spending and revenue are calculated simultaneously, so as to maximise social welfare over time. However, for various reasons, the budget often proves to be in disequilibrium, generating a temporary deficit or surplus in general government. A deficit, in turn, normally leads to government debt.

In relevant literature there are three theories explaining the causality between government revenue and spending. The first, as elaborated by Barro (1979) and Peacock and Wiseman (1979), argues that government spending determines government revenue (spend and tax hypothesis); the second theory, as developed by Milton Friedman (1978), states that government revenue determines government spending (tax and spend hypothesis); finally, according to the proponents of the third theory, such as Meltzer and Richard (1981), the causality between the two aggregates is bidirectional.

According to the first hypothesis, the long-run supply of public goods and services is considered an autonomous variable which determines the level of government spending, while government revenue plays a passive role. Thus, fiscal policy makers have to determine first the level of government spending and then find ways to finance it. Indeed, in many cases, increased demand for government spending, as a result of its lower cost, at least as perceived by the present generation, and the existence of high fiscal deficits necessitate that government expenditure is determined first and then sources of financing have to be found. The so-called "fiscal illusion" theory proposed by Buchanan and Wagner (1977) supports the exogenous nature of government revenue, since the most common means of financing expenditure is borrowing, which implies a heavier tax burden for future generations.

On the other hand, many economists believe that it is revenue and not expenditure that plays the determining role in fiscal policy planning. According to this view, the fiscal deficit is not due to changes in government spending made for political or economic reasons, but to changes in government revenue. Therefore, in order to avoid large fiscal deficits, governments will have to adjust the size of their spending.

Finally, several economists support the existence of a bidirectional causality between government spending and revenue. This hypothesis is compatible with the benefit principle, i.e. the view that marginal cost must be equal to marginal benefit. In this case, government revenue and expenditure are determined simultaneously.

These three hypotheses have been empirically tested using time series for several countries and for different periods. The results of these studies are

mixed and thus we cannot at present support any of the above-mentioned hypotheses with certainty.

Anderson *et al*. (1986), Von Furstenberg *et al*. (1986), Miller and Russek (1990), Jones and Joulfaian (1991) and Dahlberg and Johansson (1998) maintain that government spending is autonomous and determines the level of government revenue. Specifically, Anderson *et al*. (1986) maintain that changes in government spending determine changes in government revenue, while Von Furstenberg *et al*. (1986), using quarterly data for the United States for the period 1954-1982, conclude that total spending determines total revenue. Dahlberg and Johansson (1998), using data on Swedish local authorities for the period 1974-1987, establish the existence of a unidirectional causality from spending to revenue.

Manage and Marlow (1986), Ram (1988a) and Blackley (1986) argue that government revenue determines government spending. Specifically, Manage and Marlow (1986), using annual series, maintain that there is either a bidirectional causality between the two variables, dependent on the number of time lags used in the empirical analysis, or a unidirectional causality from spending to revenue. Ram (1988a), using annual series for the period 1929-1983 and quarterly series for the period 1947-1983 for the United States, maintains that government revenue determines the level of government spending. Similarly, Blackley (1986), for a different period (1929-1982), supports the same hypothesis.

Baghestani and McNown (1994), following the techniques of cointegration, detect a long-run relationship between the two variables and proceed to maintain, using the vector error-correction model, that the two variables are unrelated. Bohn (1991) estimates that there is a long-run relationship between the two variables, both expressed as percentages of GDP for the entire 1790-1988 period, while only for the period following the Korean War (1955-1988) no relationship exists.

Finally, Koren and Stiassny (1988), using annual data for the period 1953-1992, detect a unidirectional causality from revenue to expenditure, for the United Kingdom, the Netherlands, Germany and the United States. On the other hand, they find that expenditure determines revenue in the case of France, Austria and Italy and that there is no causality in the case of Switzerland and Sweden.

For Greece, empirical studies have been conducted by Ram (1988b), Provopoulos and Zambaras (1991), Kollias and Makrydakis (1995) and Hondroyiannis and Papapetrou (1996). All of them support the existence of a unidirectional causality from government spending to revenue. These studies differ in the following points: first, analyses have focused on different periods; second, the calculation of government revenue and spending has been based on different definitions; third, different methodological approaches have been used.

Specifically, Ram (1988b) and Provopoulos and Zambaras (1991) examine the period 1957-1985 using fiscal data, while they use the Granger method. Kollias and Makrydakis (1995) use fiscal data for the period 1950-1990, while testing for causality is done in two steps. In the first step, the Phillips-Hansen method is used to verify the existence of a long-run relationship; the second step

is to estimate error-correction models to detect causality. Finally, Hondroyiannis and Papapetrou (1996) use national accounts data from the old National Accounts (based on the National System of Accounts — NSA) for the period 1957-1993 and test causality in two steps. The first step is to use the Johansen method to test the existence of a long-run relationship; the second is to detect both short- and long-run causality, estimating error-correction models.

4. Definition of variables and empirical results

In the empirical investigation of causality between government revenue and spending, annual statistical data for Greece for the period 1960-1997 were used. Specifically, we used the following variables, expressed as logarithms:[3] total government revenue (LTREV) and total government spending (LTGS), both on a national accounts basis and as percentages of GDP. All statistical data for the estimation of the two variables have been derived from the new system of National Accounts used by the National Statistical Service of Greece (NSSG) for the period 1988-1997, while for the period 1960-1987 estimates by an *ad hoc* committee of Ministry of National Economy experts have been used. All figures have been estimated using the ESA method.

In contrast to other empirical studies, total revenue and total spending are calculated on a national accounts basis[4] and have been expressed as percentages of GDP for two reasons. First, because all debates about the evolution of fiscal aggregates, both at the economic and at the political level, refer to a national accounts basis. It should be noted that the fiscal criteria of the Maastricht Treaty, i.e. the government debt and the net government deficit criterion, are both expressed on a national accounts basis and as percentages of GDP, while the same holds for all convergence programmes. Second, because this conversion reduces dependence on the dynamics of nominal aggregates.

Table 1 presents stationarity tests for the statistical series used in the empirical analysis, in levels and first differences. The combined results of the three tests conducted for all variables suggest that all the time series under review are integrated of order one, I (1). That is, the combined statistical tests suggest that both time series are non-stationary, while their first differences are stationary.[5]

Next, we test the existence of a long-run relationship between the two variables. Specifically, we conduct a cointegration analysis of the two variables, using the Johansen (1988) maximum likelihood method. In estimating the vector autoregressive model (VAR), we use two time lags, a constant term and a dummy variable. The dummy variable takes value 1 for the years 1988 and 1989, when there is a significant drop in revenue, resulting in a widening fiscal defi-

3 L stands for "logarithm".

4 Data on the public sector can be calculated by three alternative methods. First, on a cash basis, taking into account disbursements and receipts as recorded by the banking system during a calendar year. Second, on an accrual basis, using as a reference period the fiscal year, which includes an extension into the next calendar year. And third, on a national accounts basis, whereby data are compiled in a uniform manner by all European Union Member States to ensure comparability.

5 For more details about the stationarity tests of the time series and the methodology used in the empirical investigation see the Appendix.

Table 1
Unit root tests

	Augmented Dickey-Fuller			Phillips-Perron			KPSS			
							l=1		l=4	
Variables	τ_τ	τ_μ	k	τ_τ	τ_μ	k	η_μ	η_τ	η_μ	η_τ
LTREV	–3.10	–1.19	0	–3.20	–1.19	1	1.757**	0.059	0.841**	0.047
LTGS	–1.73	–1.33	0	–1.67	–1.34	1	1.900**	0.170*	0.828**	0.100
ΔLTREV	–5.94**	–6.04**	0	–5.95**	–6.04**	1	0.045	0.044	0.063	0.062
ΔLTGS	–6.87**	–6.76**	0	–6.87**	–6.77**	1	0.173	0.100	0.196	0.117

Notes: The relevant tests are derived from the OLS estimation of the following autoregression for the variable involved.

$$\Delta x_t = \delta_0 + \delta_1 (time)_t - \delta_2 x_{t-i} + \sum_{i=1}^{k} \Phi_i \Delta x_{t-i} + u_t \quad (1)$$

τ_τ and τ_μ are the t-statistics for testing the significance of δ_2, when a time trend is either included (τ_τ) or not included (τ_μ) in equation 1. The critical values at 5 and 1 per cent for N=40 are -3.34 and -4.11 for τ_τ and -2.00 and -2.78 for τ_μ, respectively (Charemza and Deadman (1997), Table 1, pp. 281 and 282).The lag length structure of Φ_i of the dependent variable Δx_t is determined using a recursive procedure, in the light of the Lagrange multiplier (LM) autocorrelation test (for orders up to two) which is asymptotically distributed as χ^2 distribution and the value of t-statistic of the coefficient associated with the last lag in the estimated autoregression.
The critical values for the Phillips and Perron unit root tests are obtained by Dickey-Fuller (1981).
η_μ and η_τ are the KPSS statistics for testing the null hypothesis that the series are I(0) when the residuals are computed from a regression equation with only an intercept and intercept and time trend, respectively. The critical values for η_μ and η_τ at 5 per cent are 0.463 and 0.146 and at 1 per cent 0.739 and 0.216, respectively (Kwiatkowski *et al.*, 1992, Table 1).

* Indicates a 5 per cent significance level.
** Indicates a 1 per cent significance level.

cit.[6] Table 2 summarises the results of the cointegration analysis. The statistical tests (the eigenvalue and the trace statistic) show that both variables are moving in the same direction under the effect of a common trend, and support the existence of one cointegrating vector at the 5 per cent level between the two variables.[7] The existence of cointegration means that, although these two variables may occasionally or temporarily deviate from their long-run relationship, they tend to converge in the long run under the effect of systemic forces.

Table 3 presents the results of the test for the statistical significance of both variables. The empirical results suggest that there is a long-run relationship between the two variables (total revenue and total spending). Having verified that the variables are cointegrated, VECMs can be applied. The lagged residuals from the cointegration equation with one lag are included in the Granger-causality test structure.[8]

Table 4 (page 36) reports the findings for Granger causality, based on error-correction models for the two variables. The models include a constant

6 To determine the number of lags in the VAR, three versions of the system were estimated: a four-, a three- and a two-lag version. Then, we tested the null hypothesis that all three versions are statistically equivalent. The maximum likelihood statistic rejects the null hypothesis. In particular, VAR=2 is used in the estimation procedure of cointegration between the two variables. Subsequently, the VAR model is tested as to whether the dummy variable used is equal to zero. The test statistic provides evidence to reject the null hypothesis at 1 per cent level. Test statistics (eigenvalue and trace statistics) support the existence of one cointegration vector between the two variables at 5 per cent level.
7 The results of the empirical analysis are similar if the Phillips-Hansen (1990) method is used.
8 The error-correction models pass a series of diagnostic tests, including the error autocorrelation tests using the Lagrange multiplier.

Table 2
Johansen and Juselius co-integration tests: public revenue and expenditure, 1960-1997

Variables: LTREV, LTGS, VAR=2				
Null hypothesis	Alternative hypothesis	Eigenvalue	Critical value at 5 per cent	Critical value at 10 per cent
r=0	r=1	15.05*	14.88	12.98
r<1	r=2	3.59	8.07	6.50
Null hypothesis	Alternative hypothesis	Trace	Critical value at 5 per cent	Critical value at 10 per cent
r=0	r=1	18.63*	17.86	15.75
r<1	r=2	3.59	8.07	6.50
Z= LTREV–0.57 LTGS				

Notes: r indicates the number of co-integrating relationships. Maximum eigenvalue and trace test statistics are compared with the Johansen and Juselius critical values (1990).
* Rejection of hypothesis at a significance level of 5 per cent.

Table 3
Long-run test for the hypothesis that each variable does not enter any co-integrating vector

Variables	Test
LTREV	8.95*
LTGS	11.06*

Notes: The test of the null hypothesis follows the χ^2 distribution with degrees of freedom equal to the number of co-integrating relationships.
* Indicates a 1 per cent level of significance.

trend term and a lagged error-correction term, which estimates long-term disequilibrium. The size and statistical significance of the long-run disequilibrium term in each equation determine the speed with which each dependent variable tends to return to its long-run equilibrium. The estimation of variables suggest that the error-correction term measuring long-run disequilibrium has the appropriate sign[9] —positive or negative— in all series and is statistically significant only for the estimated regression equation of total revenue. Thus, only total government revenue as a percentage of GDP moves to restore equilibrium. The specific dynamic model therefore shows that total revenue, unlike total spending, is not weakly exogenous. The size of the error-correction term factor indicates that, in the event of fiscal imbalance, 45 per cent of the existing disequilibrium is restored within one year. Finally, it is estimated that the restoration of long-run equilibrium in a shock to the system would require about four years.

X^2 tests in both estimated regressions (ΔLTREV, ΔLTGS) show the absence of Granger causality, in the strict sense, between the two variables. By contrast, the significance levels associated with

9 In the revenue equation, the sign of the error-correction term must be negative, since revenue (LTREV) has a positive sign in the long-run relationship. In the case of the spending equation, however, the sign must be positive, since spending (LTGS) has a negative sign in the long-run relationship. In the event that this were not true, an episode affecting the long-run equilibrium would result in a deviation of the two variables from a new equilibrium and in permanent disequilibrium in the system.

Table 4
Summary of tests for weak and strong exogeneity, based on vector error correction models

	Test of restrictions				
	Short-run dynamics, non-causality, (Wald test)		Error correction term coefficient	Test for Granger non-causality, short-run dynamics and ECT (Wald test)	
Equation	ΔLTREV	ΔLTGS		ΔLTREV	ΔLTGS
ΔLTREV		0.07	–0.45*		18.52*
ΔLTGS	1.0		–0.23	3.81	

Notes: The ECT coefficient is derived from the normalisation of the long-term relationship with respect to the LTREV variable. All statistics, except for the statistic of the ECT coefficient, are distributed as χ^2 distribution. They show the significance level at which the hypothesis of non-causality between the dependent variables and the explanatory variables can be rejected. The t-statistic is used for testing the hypothesis that the ECT coefficient with one time lag is statistically significant.
* Indicates a 1 per cent significance level.

the X^2 statistic of joint significance of the sum of the lags of a single explanatory variable and the error-correction term for the regression of government revenue imply that government revenue is Granger endogenous. The significance levels associated with the X^2 statistic of the joint significance of the sum of the lags of a single explanatory variable and the error-correction term for the regression of government spending imply that government spending is strongly Granger exogenous.

Specifically, the empirical results of the study point to: a) the existence of unidirectional causality from government spending to government revenue, b) the autonomous role of government spending as an exogenous variable in determining the fiscal deficit and c) the endogenous nature of government revenue, as a result of which government revenue bears the brunt of fiscal adjustment. Overall, the empirical results support the hypothesis that government spending is autonomous and that the size of government revenue depends on the size of government spending. In other words, fiscal policy makers determine first the size of government spending and then the size of government revenue.

Even though the present study differs significantly from earlier studies of the relationship between the same variables for Greece in that it takes into account fiscal developments over the past few years and uses recently developed econometric methods, its qualitative results are in accord with those of previous studies, while the methodology used enables us to examine separately the short- and long-run relationships of the two variables. The common thread binding all studies is that, for the respective periods under review, they point to a one-way causality between the two variables, namely from government spending to government revenue, providing support for the view that causality has not changed in recent years. Although the general government deficit in the period 1980-1993 increased and then gradually began to decline under the first stabilisation programme, the causality between government revenue and spending remains unchanged. This finding is very important, since it shows that, throughout the period under review, government spending determined not only the relative size

of the public sector, but also the size of the government deficit and debt and may have been the single major factor of imbalance in the Greek economy.

5. Conclusions

This study examines the relationship between government revenue and spending. We initially analysed recent fiscal developments and verified their significance for the adjustment of the Greek economy to the fiscal criteria of the Maastricht Treaty. Then, we examined whether there is a long-run relationship between government revenue and spending as percentages of GDP in the period 1960-1997. The empirical results support the hypothesis that there is a long-run relationship between the two variables and that, although these variables may occasionally deviate from their long-run relationship, systemic forces gradually lead them back to convergence.

Error-correction model estimation showed that, in the Granger-causality sense, government revenue is the econometrically endogenous variable, while government spending is the exogenous variable. This implies that there is a unidirectional causality from government spending to government revenue. The empirical results are therefore consistent with the hypothesis that government spending determines government revenue.

These empirical results lead to certain conclusions. First, the evidence of cointegration between the two variables rules out the possibility that the estimated relationship is "spurious" and implies that Granger causality must exist. Second, the existence of a unidirectional causality from government spending to government revenue indicates that, during the period under review, the size of government spending was exogenously determined. Successive governments saw the size of government spending, and hence the size of the public sector, as a political decision, with the result that the size of revenue was determined depending on the varying needs of the public sector. The tax reforms that were introduced at times were only aimed at increasing tax revenue, so that government revenue could cover a larger part of the government spending. Third, the empirical results support the view that the existence of imbalances in the public sector, and in the Greek economy in general, was mainly due to the autonomous course of government spending. Finally, the results of this study can provide support for the view that a fiscal policy oriented towards the containment of government spending and the combatting of tax evasion rather than raising taxation will reduce fiscal deficits and speed up fiscal adjustment.

Appendix

1. Methodology

According to Engle and Granger (1987), if two variables are intergrated of degree one I(1) and are cointegrated, then either unidirectional or bidirectional Granger causality must exist, at least for the I(0) variables.

Testing for the existence of a statistical relationship among the variables is done in three steps. The first step is to verify the order of integration of the variables since the causality tests are valid only if the variables have the same order of integration. Standard tests for the presence of a unit root based on the work of Dickey and Fuller (1979, 1981), Perron (1988), Phillips (1987) and Phillips and Perron (1988)[10] and Kwiatkowski *et al.* (1992)[11] are used to investigate the degree of integration of the variables used in the empirical analysis.

The combined use of the three tests employed to investigate the degree of integration of the series may result in four possible outcomes. First, rejection by the ADF and PP statistics and non-rejection by the KPSS test gives strong evidence of stationarity. Second, non-rejection by both ADF and PP and rejection by the KPSS is a strong indication of I(1). Third, non-rejection by all tests suggests that the data is not sufficiently informative on the long-run characteristics of the series. Fourth, rejection by all tests indicates that the series is neither an I(1) nor an I(0) process. The gain from testing both stationarity and non-stationarity by employing the three tests and comparing their outcomes is that the inference is not uncertain. Specifically, the inference is either stationarity, non-stationarity or we do not know, which is preferable to being uncertain.

The second step involves testing for cointegration using the Johansen maximum likelihood approach (Johansen, 1988; Johansen and Juselius, 1990, 1992). The Johansen-Juselius estimation method is based on the error-correction representation of the VAR model with Gaussian errors. This approach has several advantages over the Engle and Granger (1987) technique employed in most recent empirical studies. First, the Johansen and Juselius method tests for any number of cointegrating vectors between the variables. These tests are based on the trace statistic test and the maximum eigenvalue test. Second, it treats all variables as endogenous thus avoiding an arbitrary choice of dependent variable. Third, it provides a unified framework for estimating and testing cointegrating relations within the framework of a vector error-correction model.

Evidence of cointegration rules out the possibility of the estimated relationship being "spurious". So long as the four variables have common trend,

10 This version of the test is an extension of the Dickey-Fuller test which makes a semi-parametric correction for autocorrelation and is more robust in the case of weakly autocorrelated and heteroscedastic regression residuals. According to Choi (1992), the Phillips-Perron tests (PP) appear to be more powerful than the ADF tests for aggregate data. For more details see Perron (1990).

11 The KPSS procedure assumes the univariate series can be decomposed into the sum of a deterministic trend, random walk and stationary I(0) disturbance and is based on a Lagrange Multiplier score testing principle. This test reverses the null and the alternative hypothesis. A finding favourable to a unit root in this case requires strong evidence against the null hypothesis of stationarity. The KPSS test is defined as: $\eta = T^{-2} \frac{\Sigma S_t^2}{S^2(k)}$, where $S^t = \sum^t e_i$ *(i = 1, 2, ...,t)* and e_i is the partial sum of the residuals from regressing the series on an intercept and possibly a time trend. $s^2(k)$ is a consistent non-parametric estimate of the disturbance variance and T is the sample size.

causality, in the Granger sense and not in the structural sense, must exist in at least one direction. Although cointegration implies the presence of Granger causality, it does not necessarily identify the direction of causality between variables. This temporal Granger-causality can be captured through the vector error-correction model derived from the long-run cointegrating vectors (Granger, 1986, 1988).

Thus, the third step involves utilisation of the VECM and testing for exogeneity of variables. Engle and Granger (1987) show that in the presence of cointegration, there always exists a corresponding error-correction representation which implies that changes in the dependent variable are a function of the level of disequilibrium in the cointegrating relationship, captured by the error-correction term (ECT), as well as changes in other explanatory variables. Thus through ECT, the VECM modelling establishes an additional way to examine the Granger causality ignored initially by the Granger-Sims tests. The Wald-test[12] applied to the joint significance of the sum of the lags of each explanatory variable and the X^2 test of the lagged error-correction term will imply statistically the Granger exogeneity or endogeneity of the dependent variable. The non-significance of ECT is referred as a long-run non-causality which is equivalent to saying that the variable is weakly exogenous with respect to long-run parameters. The absence of short-run causality (Granger causality in the strict sense) is established from the non-significance of the sums of the lags of each explanatory variable. Finally, the non-significance of all the explanatory variables including the ECT term in the VECM indicates the econometric strong-exogeneity of the dependent variable, that is the absence of Granger-causality.

2. Empirical test for the stationarity of the series

The ADF statistic (Table 1) suggests that all variables are integrated of order one, I(1), whereas the first differences are integrated of order zero, I(0). Therefore, the hypothesis that the time series contain an autoregressive unit root is accepted in all cases. Although employing the Phillips-Perron test gives different lag profiles for the various time series and sometimes lowers the level of significance, the main conclusion is qualitatively the same as reported above by the Dickey-Fuller tests. In particular, the Phillips-Perron test based on the 5 and 1 per cent critical values supports the hypothesis that all series contain a unit root. Thus, both tests are in favour of the unit root hypothesis in all time series.

Finally, the KPSS statistics test for lag-truncation parameters one and four ($l=1$ and $l=4$)[13] since it is unknown how many lagged residuals should be used to construct a consistent estimator of the residual variance. The KPSS test rejects the null hypothesis of level and trend stationarity for both lag truncation parameters. The KPSS statistics does not reject the I(0) hypothesis for the first differences of the series at different levels of significance. Therefore, the combined results from all the tests (ADF, PP, KPSS) suggest that all the series under consideration appear to be I(1) processes.

12 The Wald test follows the X^2 distribution with degrees of freedom equal to the number of restrictions.

13 The KPSS statistics are known to be sensitive to the choice of truncation parameter l and tend to decline monotonically as l increases. The test has been estimated for eight and twelve time lags. Although the estimated statistics may differ with respect to the significance levels, the qualitative results remain the same.

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The distributional impact of excise duties[1]

Theodore M. Mitrakos
Bank of Greece
Economic Research Department

Panos O. Tsakloglou
Athens University of Economics and Business,
and Athens Institute for Economic Policy
Research (IMOP)

1. Introduction

The dominant issue for the European Union Member States in the past few years has been the achievement of monetary convergence for participation in the final stage of Economic and Monetary Union (EMU). The reduction in inflation, long-term interest rates and fiscal deficits, in accordance with the Maastricht Treaty criteria, comprised, during the last two years, the main economic policy goals of most Member States. The results of this policy were rather encouraging. Those of the EU Member States which so desired achieved their participation in the first phase of the common currency, since they managed to fulfil the Treaty's criteria. Even though Greece, as expected, did not meet the convergence criteria, it made significant progress. However, the devaluation of the drachma in March 1998 and the latest international upheaval led to the revision of the convergence programme's original targets, especially concerning the reduction of inflation and interest rates.

On the inflation front, additional policy instruments were called upon in the final months of 1998, chief of which was the reduction in indirect taxes and, more specifically, in the excise duties on fuels (transportation and heating fuels) and cars. As a result, a large part of the public debate these last few months has been focused on both the negative effects of this policy on public revenue and its positive effects on the level of prices.

1 The views expressed in the present study are those of the authors and not necessarily those of the Bank of Greece. We wish to thank H. Gibson and G. Kaplanoglou, as well as G. Alogoskoufis, Th. Georgakopoulos and V. Droukopoulos for their useful remarks.

It has been estimated that the reduction of excise duties on fuels in the autumn of 1998 led to the loss of about 80 billion drachmas a year in revenue against a fall of about 0.4 percentage point in inflation,[2] while the replacement of excise duties and the one-off additional special tax on automobiles by a new "registration tax" led to a reduction of about 0.3 percentage point in inflation and to a loss of about 70 billion drachmas a year in public revenue.[3]

The public debate has focused almost exclusively on the impact of the measures on public revenue and inflation. An important dimension, in our opinion, has escaped attention in this debate. The distributional impact of such a policy and, therefore, its social dimension is almost always ignored.

The aim of the present paper is to investigate the distributional impact of excise duties and, by extension, the possible distributional impact of the recent measures. For the purposes of this paper, we utilise the micro-data of the latest Household Budget Survey (HBS) conducted in 1993/94. The rest of the paper is organised as follows: the next section attempts a short description of the structure of taxation in Greece, while the third section deals with methodological issues. The fourth section contains the empirical results, while the final section provides the conclusions, as well as a brief report of their significance for the conduct of economic policy.

2. The structure of taxation in Greece

During the last two decades, tax revenue in Greece as a percentage of GDP rose significantly and is now approaching the EU average (OECD, 1988; Georgakopoulos, 1992). Specifically, in the year that almost coincides with the HBS used in the paper (1994), total tax revenue as a percentage of GDP was about 23 per cent in Greece as against 27 per cent in the EU as a whole. However, the structure of revenue is much different in Greece. Specifically, about two-thirds of tax revenue comes from indirect taxes, compared with an EU average of 52 per cent.

Table 1
Structure of tax revenue in Greece (1994)

Type of tax	Percentage share in total tax revenue	
Income taxes	26.2	
Other direct taxes	7.7	
VAT	32.8	
Excise duties on heating and transportation fuels	13.8	
a) Liquid gas		0.04
b) Gasoline		7.91
c) Diesel		5.16
d) Crude oil and other fuels		0.69
Excise duties on tobacco products	6.4	
Excise duties on vehicles	3.2	
Excise duties on alcoholic beverages	0.8	
Other indirect taxes	9.1	

Source: Government Budget for 1996.

As Table 1 shows, about three-quarters of direct taxes in 1994 came from income taxes. In the same year, VAT contributed almost half of total income from indirect taxes, and excise duties contributed one third. In absolute terms, excise duties rose to 5.5 per cent of GDP, while their

2 Consumption tax on transportation fuels (gasoline) was cut, at the end of September 1998, from 111 to 103 drachmas per litre, while tax on heating fuels (petroleum) was reduced, in mid-October 1998, from 28 to 20 drachmas per litre.

3 It should be noted that, in contrast to the loss in public revenue, the effect of the reduction in the excise duties on the rate of change in the Consumer Price Index is transitory.

Table 2
Structure of excise duties in Greece (1994)

Commodity group	Revenue from excise duties (in million drachmas)	Share of revenue from excise duties in total revenue (percentages)
Heating and transportation fuels	722,842	56.9
a) Liquid gas	1,869	0.15
b) Gasoline	414,220	32.58
c) Diesel	270,321	21.26
d) Crude oil etc.	36,432	2.87
Tobacco products	334,637	26.3
Vehicles	165,018	13.0
Alcoholic beverages	41,528	3.3
Other commodities	7,251	0.6
Total	1,271,276	100.0

Source: Government Budget for 1996.

contribution to total tax revenue, 24 per cent, is one of the highest in the EU (Georgakopoulos, 1992). Four main commodity groups are subject to excise duties: alcoholic drinks, tobacco products, fuels (heating and transportation) and vehicles. Table 2 reports the contribution of each of these groups to total revenue from excise duties.

It follows from the data on Table 2 that 56.9 per cent of this revenue comes from fuels and 26.3 per cent from tobacco products. Consumption taxes on vehicles, alcoholic drinks and other commodities (especially bananas) account for a much smaller share.[4]

Excise duties on these commodities are calculated taking into account not only producer prices but various other features of the goods, such as alcohol content, cigarette length, fuels use, engine capacity, etc. (Georgakopoulos, 1992; Alogoskoufis, 1996). The rate of excise duties on beer is 9 per cent of the retail price, while for other high-grade alcoholic drinks, this percentage rises to 15 per cent of the retail price[5] (Alogoskoufis, 1996). According to the same source, excise duties on cigarettes and tobacco represent 57.5 per cent of the retail price, while the corresponding rate for cigars and cigarillos is 26 per cent. In the case of central heating fuels and gas (used for heating and cooking), excise duties represent 16.5 per cent and 6.5 per cent of the final price, respectively, while for transportation fuels, the percentage rises to 60 per cent.[6] Finally, the percentage of excise duties in the final price of vehicles depends on the type of vehicle and engine capacity. In comparison with the rest of the EU members, excise duties on alcoholic drinks and transportation fuels are relatively lower in Greece, but higher on heating fuels and vehicles and about average on tobacco products (Georgakopoulos, 1992; Alogoskoufis, 1996).

The literature on the distributional impact of taxation in Greece is rather limited and contains few systematic studies on the subject; there is no empirical study of the distributional impact of excise duties based on detailed data. Previous studies on the distributional impact of taxation, based either on grouped published HBS data (Karayiorgas, 1973, 1977) or tax returns (Germidis and Negreponti-Delivanis, 1975) for the 1960s and 1970s, concluded that the overall impact of taxation in Greece was regressive, even though some of their conclusions were disputed by Provopoulos (1979). Specifically, Germidis and Negreponti-Delivanis (1975) claim that the clearly

4 It should be noted that, until the early 1990s, consumption taxes on vehicles were significantly higher. They contributed about 40 per cent of revenue from excise duties and were equivalent to 3.5 per cent of GDP (Georgakopoulos, 1992).
5 Wine is not subject to excise duties in Greece and in many other EU countries.
6 This coefficient is different for leaded and unleaded gasoline and significantly lower for diesel fuel.

regressive character of indirect taxes more than compensates for the mildly progressive character of direct taxes. Patiniotis (1983), Bakarezos (1984) and Vartholomeos (1984) draw similar conclusions. Loizides (1986, 1988) and Papapanagos (1994) use data from tax returns, focus exclusively on the impact of direct taxation and conclude that the impact of direct taxation in Greece is progressive. However, their results should be interpreted with caution, since they exclude from their analysis the poorest population groups that do not fill in tax returns and they ignore completely the impact of tax evasion. Concerning the distributional impact of VAT, Sapounas (1987), using *ex ante* analysis under alternative scenarios, anticipated that the impact of this tax would be strongly progressive, while estimations by Georgakopoulos (1990, 1991, 1992) suggest that the effect of VAT is slightly progressive, although the author does not offer an explicit opinion. Finally, as pointed out above, none of the existing studies is specifically focused on the distributional impact of excise duties.

3. Statistical data and methodology

The present study is based on the data of the most recent HBS, conducted by the National Statistical Service of Greece (NSSG) between September 1993 and October 1994. The survey covered all private households in the country, with a sampling fraction of 2/1000 (about 6,700 households). Its main purpose was to collect analytical data in order to compute the weighting coefficients of the goods and services taking part in the compilation of the Consumer Price Index and it contained detailed information about consumption expenditure (real and imputed) and income, as well as various socio-economic characteristics of the households and their members.

In this study, the (unobservable) welfare level of a household is approximated by its level of consumption expenditure. This choice was dictated by two reasons. The first one is theoretical. According to macroeconomic theory, individuals derive utility from the consumption of goods and services. Given that the marginal utility of consumption is positive but diminishing, they vary their savings in the various phases of their life cycle, trying to smooth out their consumption. As a result, current consumption can be considered a better indicator of the long-term welfare level of population members than current income. Moreover, the use of consumption data in the framework of the present study can help overcome the problems that arise from comparing different phases of population members' life cycles. The second reason is more practical, since — according to NSSG — the consumption expenditure data of the HBS are considered more reliable than the corresponding income data.

The concept of consumption expenditure used in the present study contains, apart from the value of purchased goods and services, consumption of own production and other income in kind, as well as the imputed rent of owner-occupiers. The HBS data were suitably adapted in order to be used for estimating the excise duties' distributional impact. Specifically, a small number of households was removed from the sample for reasons of reliability; the HBS sample was weighted on the basis of the results of the 1994 Labour Force Survey, so that the total population of the country could be better represented; moreover, all data on con-

sumption expenditure were expressed in average 1994 prices, in order to remove the impact of inflation (9.8 per cent from the start to the end of HBS). Finally, the value of purchased cars during the period of the survey was subtracted from the definition of "consumption expenditure" and was replaced by the value of imputed car services, estimated using "hedonistic" regression techniques for all households that owned cars.

Probably, HBSs are the best data sources for studies of income distribution and redistribution in Greece and certainly provide the best available data for the purposes of the present study. However, a series of factors makes them far from ideal. First, unlike the VAT, some excise duties are not paid directly by consumers. Apart from final consumer goods, excise duties are also imposed on commodities that are intermediate resources used for the production of final goods: for example, commercial vehicles and the heating and transportation fuels used by enterprises. Obviously, in these cases as well, taxes are passed on to consumers of the respective final goods and services through higher prices. However, the information available through the HBS is not enough to estimate the distributional impact of these excise duties.

Second, excise duties on vehicles vary enormously, depending on the type and engine capacity of the vehicle. However, the only relevant information included in the HBS regards the number of vehicles per household and expenditure for a car purchase during the 12 months that preceded the survey. The latter expenditure is recorded for a very small fraction of the households owning vehicles in the sample. It is obvious that under these conditions it is not possible to estimate the distributional impact of excise duties on vehicles by using the data of the HBS. For this reason, excise duties on vehicles are left out of the present analysis.

Third, a comparison of HBS estimates with corresponding estimates derived from the Table of National Accounts on Private Consumption Expenditure reveals significant differences for some of the commodities that are subject to excise duties. To some extent, these discrepancies are expected and can be attributed to differences in definitions and samples between HBS and National Accounts and do not necessarily imply that HBS estimates are less reliable than the other. Even if this were true, any adjustment in the HBS data would be arbitrary. Therefore, it was decided to avoid any sort of adjustment in HBS data.

Fourth, since the HBS data collection period for each household was relatively short (two weeks), the frequency of zero expenditure on some commodity groups may be considered as relatively high. This is not necessarily true for the majority of commodities used in the present analysis. However, in the case of alcoholic drinks a slightly different problem is encountered. In the HBS, expenditure on alcoholic drinks consumed out of home (in restaurants, bars, cafés etc.) is not included in the "alcoholic drinks" category, but in "food and drinks out of home". Therefore, it is not possible to estimate the distributional impact of relevant excise duties, and our analysis is limited to estimating excise duties on alcoholic drinks consumed at home.

The general approach adopted in the present study is the following: we initially estimate the

actual (non-imputed) expenditure per household for alcoholic drinks (separately for beer and spirits of high-alcohol content), tobacco products (separately for cigarettes, cigars and pipe tobacco), heating fuels (separately for central heating fuels and gas)[7] and transportation fuels.[8] Then, for each category of the above expenditure, we estimate the component which corresponds to excise duties, on the basis of the tax rates on retail prices referred to in the previous section.

In the next stage, there follows a descriptive analysis of deciles. Specifically, we present distributions of equivalent consumption expenditure when the population is stratified by deciles (from the poorest 10 per cent to the richest 10 per cent) before and after the imposition of excise duties, as well as the corresponding Lorenz and concentration curves. We also estimate inequality in the distribution of equivalent consumption expenditure per household before and after the imposition of excise duties. Comparison of inequality before and after the imposition of excise duties is conducted with the help of five indices: Gini (G), Theil (T), the mean logarithmic deviation (N), the variance of the logarithms (L) and the Atkinson index (A, for $e=0.5$ and $e=2$). These indices are defined as follows:

$$G=\sum_{i=1}^{n}\sum_{j=1}^{n}|\ y_i-y_j\ |\Big/2n^2\mu \qquad (1)$$

$$T=\frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\mu}\ln\left(\frac{y_i}{\mu}\right) \qquad (2)$$

$$N=\frac{1}{n}\sum_{i=1}^{n}\ln\left(\frac{\mu}{y_i}\right) \qquad (3)$$

$$L=\frac{1}{n}\sum_{i=1}^{n}(\ln y_i-\ln\mu^*)^2 \qquad (4)$$

$$A=1-\frac{1}{\mu}\left[\frac{1}{n}\sum_{i=1}^{n}y_i^{1-e}\right]^{\frac{1}{1-e}} \text{ for } e\neq 1 \text{ and } i,j=1,2,3,..,n \qquad (5)$$

where y_i is the (equivalent) consumption expenditure of household i ($i,j=1,2,3,...,n$), n is the size of the population and μ, μ* are, respectively, the mean and geometric mean of the total (equivalent) consumption expenditure of the population. The constant e in the Atkinson index expresses the degree of aversion to inequality, that is, the relative sensitivity of the index to transfers along various parts of the distribution. The bigger e is, the more weight is given to transfers at the lower end of the distribution.

These indices satisfy the basic axioms required of an inequality index. They are the symmetry axiom (if two individuals "exchange" their incomes, the value of the index remains the same), the axiom of independence relative to the means and the monetary unit of measurement (if the incomes of all members of the population change by the same proportion, the value of the index remains unchanged), the axiom of independence relative to population size (if we join two or more populations with identical income distributions, the index value does not change) and the principle of transfers (a transfer of income from a rich to a poor individual which does not affect the relative position of these individuals leads to a lower value[9]

7 The latter include gas which is used mainly for cooking and is taxed at the same rate as gas used for heating.

8 HSB provide no information on the type of transportation fuels (leaded or unleaded gasoline, diesel). However, Ministry of Finance data (1995) suggest that the great majority of private cars in 1994 used leaded gasoline; thus, in our analysis we use the relevant analogy (60 per cent of the retail price).

9 As Creedy (1977) proves, the variance of the logarithms violates the transfer principle for incomes higher than μ*e, where e is the base of the natural logarithms; the principle holds true for the greatest part of incomes which are lower than this value. This means that a regressive transfer from a rich to a very rich individual will result in a lower value for the logarithm variance, instead of the expected increase. In practice, the probability of violation of the transfer principle by index *L* is very small.

of the index). The indices are sensitive to different types of transfers (Cowell, 1995). Specifically, Atkinson's index ($e=2$), the variance of the logarithms and the mean logarithmic deviation are relatively more sensitive to transfers at the lower end of the distribution, the Theil and Atkinson (for $e=0.5$) indices at the upper end, and the Gini coefficient around the mean. Thus, the combined use of these indices satisfies a wide range of tastes relative to the degree of index response to different types of transfers.

In the last stage of the study, we use the technique of inequality decomposition by factor components. In this way, we estimate both the contribution of the various excise duties to aggregate inequality and the elasticity of the inequality indices relative to changes in the various excise duties. Inequality decomposition is based on the decomposition of the Gini coefficient according to the methodology of Pyatt, Chen and Fei (1980),[10] who demonstrate that the Gini coefficient can be written as follows:

$$G=\sum_{i=1}^{k}\frac{\mu_i}{\mu}R_i G_i \qquad (6)$$

where G_i is the Gini coefficient for the expenditure component i (1,2, ..., k, in our case these components correspond to the various excise duties and to consumption expenditure without excise duties), R_i is the relative correlation coefficient, defined as the ratio of the covariance between consumption expenditure (excise duties) for the component i and the rank of total consumption expenditure, to the covariance between the consumption expenditure component i and its own rank within the same consumption expenditure component (excise duties)[11] and μ_i/μ is the proportion of consumption expenditure on component i (excise duties) in total consumption expenditure (μ_i is the mean consumption expenditure of component i in the whole population). The higher the relative correlation coefficient R_i, the Gini coefficient G_i of the distribution of the particular excise duties expenditure component, and its proportion μ_i/μ in total consumption expenditure, the higher the influence of the corresponding excise duty expenditure component on the determination of aggregate inequality. Dividing both sides of (6) by G, we have:

$$\sum_{i=1}^{k}w_i g_i=1 \qquad (7)$$

where $w_i = \mu_i/\mu$ and $g_i = R_i(G_i/G)$ is the relative concentration coefficient of component i (excise duties) in aggregate inequality and, therefore, wg_i is the contribution of component i (excise duties) in aggregate inequality – its factor inequality weight. Equation (7) shows the direct dependence of aggregate inequality on the degree of inequality within each expenditure component (G_i), the degree of correlation between expenditure in each component and total consumption expenditure (R_i) and the weight of the expenditure of each component in the total (w_i). An increase in the expenditure of component i will lead to an

10 This technique has been used by several authors for the study of the contribution of individual income sources to aggregate inequality. See Fields (1979), Lerman and Yitzhaki (1985), Podder (1993), Adams (1994), Jenkins (1995), Achdut (1996), Sotomayor (1996), Gustafsson and Shi (1997) and Aaberge (1997). For a detailed presentation and application of this technique in the Greek context see Mitrakos (1998). This technique has also been used, to a lesser extent, for an estimation of the progressive nature of indirect taxes, see Yitzhaki and Thrisk (1990) and Garner (1993).

11 That is, $R_i=\frac{\mathrm{cov}(y_i,r)}{\mathrm{cov}(y_i,r_i)}$, where y_i is the vector of the consumption expenditure component i (1,2, ...,k) and r is the corresponding rank of the total consumption expenditure vector when total expenditure of the households in the sample is ranked in ascending order of size.

increase or a decrease in aggregate inequality if g_i is greater than, or less than, unity. Thus, the elasticity, e_i, of the Gini coefficient relative to consumption expenditure component *i* can be easily calculated from the formula:

$$e_i = \frac{dG}{d\mu_i}\frac{\mu_i}{G}\left[\frac{\partial G}{\partial \mu_i} + \frac{\partial G}{\partial \mu}\frac{d\mu}{d\mu_i}\right]\frac{\mu_i}{G}$$

$$= \frac{1}{\mu}[R_i G_i - G]\frac{\mu_i}{G} = w_i g_i - w_i \qquad (8)$$

Equation (8) provides the percentage change in the Gini coefficient of distribution of total consumption expenditure that results from a percentage change in the mean expenditure in the *i* component (excise duties). The sum of all previous elasticities is always zero, since an equiproportionate increase in the expenditure for all components will leave aggregate inequality and the Gini coefficient unaffected (a result of the axiom of independence relative to the mean).

As will become apparent further on, the different sensitivity of the inequality indices is crucial for some of the results in this study. For this reason, it was deemed necessary, during the decomposition of aggregate inequality, to use the parametric form of the Gini coefficient (generalised Gini coefficient, see Yitzhaki, 1983). The generalised Gini coefficient is defined and decomposed on the basis of (6) as follows:

$$G(u) = -\frac{u}{\mu} cov\left[y, \left(1 - \frac{r}{n}\right)^{u-1}\right] \qquad (9)$$

where *u* is the inequality aversion parameter and expresses the varying sensitivity of the index to transfers along various sections of the distribution. Specifically, for $u=2$ we have the conventional Gini coefficient, with a sensitivity around the distribution median; for $u>2$ we have relatively greater sensitivity to transfers at the lower end of the distribution, while for $1<u<2$ we have relatively greater sensitivity to transfers at the upper end of the distribution. Equation (9) is adopted in the next part of the study, where aggregate inequality is decomposed on the basis of the Gini coefficient for $u=1.5$, $u=2$, $u=3$ and $u=4$.

The unit of analysis in the present study is the household, and the distributions refer to the equivalent consumption expenditure per household, so as to take account of the effect of economies of scale in consumption, as well as of the different needs of adults and children. The adopted equivalence scales are the so-called "modified OECD scales" (Hagenaars *et al*., 1994) that have been widely used in the Eurostat distributional studies. These scales assign a weight of 1 to the household head, 0.5 to the other adults in the household and 0.3 to each child (aged up to 13). Compared with other kinds of equivalence scales used in relevant empirical studies, these scales are close to the mean concerning the indicated economies of scale (Buhmann *et al*., (1988). By dividing a household's total consumption expenditure by the relevant equivalence scale, we get the equivalent consumption expenditure, which is used as an index of welfare level.

4. Empirical results

Empirical investigation starts with Table 3. In this table, the households in the sample are ranked in ascending order of equivalent consumption expenditure and, then, classified into deciles from the poorest (first decile) to the richest (tenth decile). Column (1) contains the mean equivalent consumption expenditure (in drachmas per

Table 3

Equivalent consumption expenditure on alcoholic drinks, tobacco products, heating and transportation fuels, subject to excise duties

Decile	Mean equivalent consumption expenditure per month (total, in drachmas)	Alcoholic drinks			Tobacco products			Heating fuels			Transportation fuels		
		Mean equivalent consumption expenditure (in drachmas)	Mean equivalent excise duties (in drachmas)	(3)/(1) x1,000	Mean equivalent consumption expenditure (in drachmas)	Mean equivalent excise duties (in drachmas)	(6)/(1) x1,000	Mean equivalent consumption expenditure (in drachmas)	Mean equivalent excise duties (in drachmas)	(9)/(1) x1,000	Mean equivalent consumption expenditure (in drachmas)	Mean equivalent excise duties (in drachmas)	(12)/(1) x1,000
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1st	57,574	112	14	0.24	1,758	1,011	17.55	1,989	264	4.58	229	137	2.38
2nd	85,849	239	29	0.33	2,711	1,559	18.16	2,750	400	4.66	861	517	6.02
3rd	106,653	273	34	0.31	3,407	1,959	18.37	3,268	495	4.64	1,887	1,132	10.62
4th	126,346	403	48	0.38	3,896	2,240	17.73	3,203	487	3.85	2,777	1,666	13.19
5th	145,427	496	58	0.40	4,873	2,802	19.26	3,604	557	3.83	4,209	2,525	17.36
6th	167,054	649	78	0.46	4,754	2,734	16.36	3,910	610	3.65	4,924	2,954	17.68
7th	192,517	757	91	0.47	4,732	2,721	14.13	4,426	699	3.63	6,586	3,952	20.53
8th	225,564	842	103	0.45	6,221	3,577	15.86	4,489	708	3.14	7,962	4,777	21.18
9th	275,187	1,136	142	0.51	6,518	3,748	13.62	4,910	788	2.86	10,381	6,229	22.63
10th	423,755	1,746	222	0.52	6,592	3,788	8.94	6,223	1,001	2.36	15,065	9,039	21.33

Source: Calculations based on micro-data from the 1993/94 Household Budget Survey of NSSG.

month) of each decile. The content of the next three columns is the same for each of the four commodity groups subject to excise duties (alcoholic drinks, tobacco products, heating and transportation fuels). Columns (2), (5), (8) and (11) depict the mean monthly equivalent consumption expenditure for these groups[12] for each decile. By dividing the figures in columns (2), (5), (8) and (11) with the corresponding figures in column (1) we obtain the share of each of the goods categories under examination in total consumption expenditure. These shares provide an approximate picture of the income elasticity of demand for these groups. When the consumption expenditure share increases, as we move towards the higher deciles, the corresponding commodities are characterised as "luxury goods", while they become "primary necessities" when this share diminishes.[13]

None of the commodities examined can be called an "inferior good", since, on the whole, expenditure on them does not decrease when income increases.[14] At any rate, despite the fact that mean equivalent consumption expenditure increases for each commodity group as we move from the lowest to the highest decile, the shares of these goods in total expenditure do not follow a similar pattern. The share of alcoholic drinks increases almost steadily as we move to the higher deciles, the share of tobacco products is initially relatively stable and then suddenly declines, the share of heating fuels declines monotonically, while the share of transportation fuels steadily increases up to the 9th decile and then declines slightly. These findings give an initial impression of the nature of the distributional impact of excise duties regarding the commodity groups under examination. Since alcoholic drinks and transportation fuels are luxury goods, it is possible that the imposition of excise duties on them will lead to a reduction in income inequality. The opposite may happen in the case of primary necessities, like tobacco products and heating fuels.

Columns (3), (6), (9) and (12) in Table 3 represent the mean equivalent excise duty in each decile for the four commodity groups. It follows from these data that, with few exceptions, the excise duty paid for each commodity group increases as we move towards the higher deciles. However, in the case of alcoholic drinks and transportation fuels, these increases are greater than in the case of tobacco products and heating fuels. For example, the equivalent excise duties paid by households in the 10th decile for tobacco products and heating fuels are, respectively, 3.75 and 3.79 times higher than the equivalent excise duties paid by households in the 1st decile. By contrast, the respective ratios for alcoholic drinks and transportation fuels are 15.86 and 65.98. It is obvious that the distributional impact of excise duties can differ widely among the various commodity groups.

The estimates of columns (4), (7), (10) and (13) of Table 3, as well as Chart 1, confirm that the proportion of excise duties to total consumption expenditure, in the case of tobacco products and

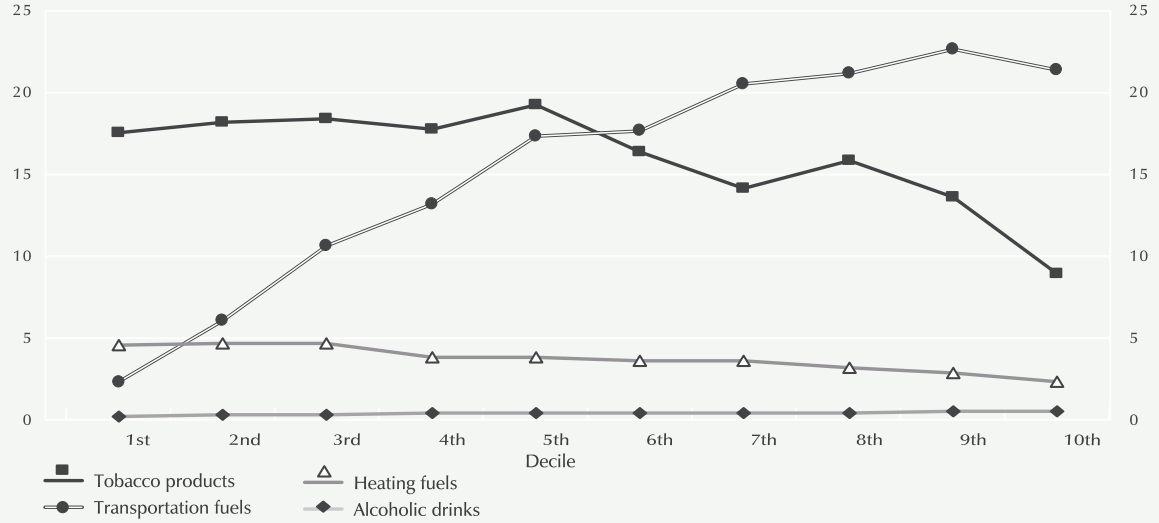
12 That is, the household's monthly consumption expenditure for each commodity group subject to excise duties divided by the number of the household's equivalent adults.

13 A rigorous examination shows that this is not absolutely correct, because, first, the consumption expenditure figures for the four commodity groups do not take account of imputed expenditure and, second, household savings are ignored.

14 Exemptions from this rule are observed in the 6th and 7th decile, in the case of tobacco products, and in the 4th decile, in the case of heating fuels.

Chart 1

Ratio of mean equivalent excise duties to mean equivalent consumption expenditure per decile and commodity group (x1000)



Source: Calculations based on micro-data from the 1993/94 Household Budget Survey of NSSG.

Table 4

Equivalent consumption expenditure on all items subject to excise duties

Decile	Average equivalent consumtion expenditure per month (total in drachmas)	All categories of goods		
		Mean equivalent consumption expenditure (in drachmas)	Mean equivalent excise duties (in drachmas)	(3)/(1) x 1,000
	(1)	(2)	(3)	(4)
1st	57,574	4,087	1,426	24.76
2nd	85,849	6,561	2,504	29.17
3rd	106,653	8,835	3,620	33.94
4th	126,346	10,279	4,441	35.15
5th	145,427	13,182	5,942	40.86
6th	167,054	14,237	6,375	38.16
7th	192,517	16,502	7,463	38.76
8th	225,564	19,514	9,165	40.63
9th	275,187	22,944	10,906	39.63
10th	423,755	29,625	14,050	33.16

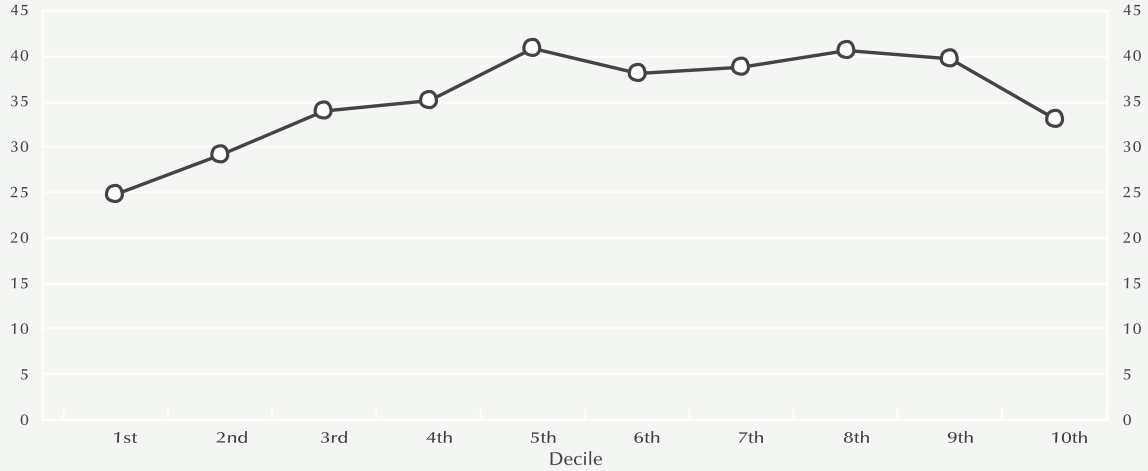
Source: Calculations based on micro-data from the 1993/94 Household Budget Survey of NSSG.

heating fuels, is higher in the poorer than in the richer households. The opposite is true in the case of alcoholic drinks and transportation fuels. For example, the share of excise duty in total consumption expenditure of the 1st decile on tobacco products and heating fuels is, respectively, 1.96 and 1.94 times higher than the corresponding share of the 10th decile. On the other hand, the respective ratios for alcoholic drinks and transportation fuels are just 0.45 and 0.11.

The aggregate impact of excise duties is exam-

Chart 2

Ratio of mean equivalent excise duties to mean equivalent consumption expenditure per decile for all commodities (excluding vehicles) subject to excise duties (x1000)



Source: Calculations based on micro-data from the 1993/94 Household Budget Survey of NSSG.

ined in Table 4 and Chart 2. Table 4 is similar to Table 3, but, instead of examining each commodity group separately, it includes in the last three columns the sum of mean consumption expenditure for all four commodity groups, the mean equivalent tax corresponding to this expenditure, as well as the tax share in total consumption for each decile. Both mean equivalent consumption expenditure on the groups under examination and the mean equivalent excise duty increase as we move towards the higher-income deciles. However, the excise duty share in total consumption expenditure takes, approximately, the shape of an inverted U as we move from the poorest to the richest decile. This share has its lowest value in the first decile, 2.48 per cent, and steadily increases until the fifth decile, where it reaches its peak, at 4.09 per cent. Thereafter, it declines gradually, but not monotonically, reaching 3.32 per cent in the top decile. Based on these data, it is very difficult to predict the total overall distributional impact of excise duties.

Table 5 (next page) contains some of the most important results of the study. The first part of this table reports the shares of each decile in monthly mean consumption expenditure, while the second part contains estimates of the inequality indices. The upper part of the first column contains the share of each decile in the distribution of equivalent consumption expenditure. The lower part of the same column reports estimates of the inequality indices referring to the distribution of equivalent consumption expenditure per household. The next four columns contain once again the shares in expenditure of total population, by decile, when the excise duty is deducted separately for each of the four commodity groups.[15] For example, distribution in the second column is the dis-

15 That is, compared with the distribution in the first column, in every one of the other columns in Table 5 the distribution average declines and a re-ranking of households is observed. Thus, on the basis of distribution in columns (1) and (5), the 10 per cent of the poorest households seems to account for 3.19 per cent (23.45 per cent) of total consumption expenditure, while after deduction of the excise duty on transportation fuels, the corresponding share rises to 3.23 per cent (23.38 per cent).

Table 5

Budget shares and inequality indices for equivalent consumption expenditure before and after the imposition of excise duties

Excise duties	Equivalent consumption expenditure	Equivalent consumption expenditure (excluding excise duties on alcoholic beverages)	Equivalent consumption expenditure (excluding excise duties on tobacco products)	Equivalent consumption expenditure (excluding excise duties on heating fuels)	Equivalent consumption expenditure (excluding excise duties on transportation fuels)	Equivalent consumption expenditure (excluding excise duties on means of transportation)
	(1)	(2)	(3)	(4)	(5)	(6)
			Percentage of total			
Decile						
1st	3.19	3.18	3.17	3.19	3.23	3.21
2nd	4.75	4.77	4.73	4.75	4.82	4.79
3rd	5.91	5.90	5.88	5.90	5.95	5.92
4th	7.00	7.00	6.97	6.99	7.03	6.99
5th	8.05	8.06	8.02	8.06	8.06	8.03
6th	9.26	9.25	9.23	9.25	9.25	9.23
7th	10.66	10.65	10.68	10.66	10.65	10.64
8th	12.49	12.50	12.47	12.49	12.45	12.42
9th	15.25	15.24	15.28	15.25	15.19	15.21
10th	23.45	23.46	23.58	23.47	23.38	23.56
			Inequality indices			
Gini index	0.3068	0.3068	0.3087	0.3072	0.3044	0.3067
		(0.00%)	(0.62%)	(0.13%)	(–0.78%)	(–0.03%)
Theil index	0.1571	0.1571	0.1592	0.1575	0.1550	0.1575
		(0.00%)	(1.34%)	(0.25%)	(–1.34%)	(–0.25%)
Mean logarithmic deviation	0.1579	0.1579	0.1598	0.1583	0.1552	0.1574
		(0.00%)	(1.20%)	(0.25%)	(–1.71%)	(–0.32%)
Logarithm range	0.3195	0.3194	0.3228	0.3203	0.3128	0.3167
		(0.00%)	(1.03%)	(0.25%)	(–2.10%)	(–0.88%)
Atkinson index (e=0.5)	0.0756	0.0756	0.0765	0.0758	0.0745	0.0756
		(0.00%)	(1.19%)	(0.26%)	(–1.46%)	(–0.00%)
Atkinson index (e=2)	0.2751	0.2751	0.2774	0.2757	0.2704	0.2732
		(0.00%)	(0.84%)	(0.22%)	(–1.71%)	(–0.69%)

Source: Calculations based on raw data from the 1993/94 Household Budget Survey of NSSG.

tribution of equivalent consumption expenditure, with the excise duty on alcoholic drinks deducted; and so on for the next three columns. The last column refers to the distribution of equivalent consumption expenditure with all excise duties deducted. The percentages in parentheses under the estimates of the inequality indices in columns (2)-(6) are their percentage differences from the corresponding indices in column (1).

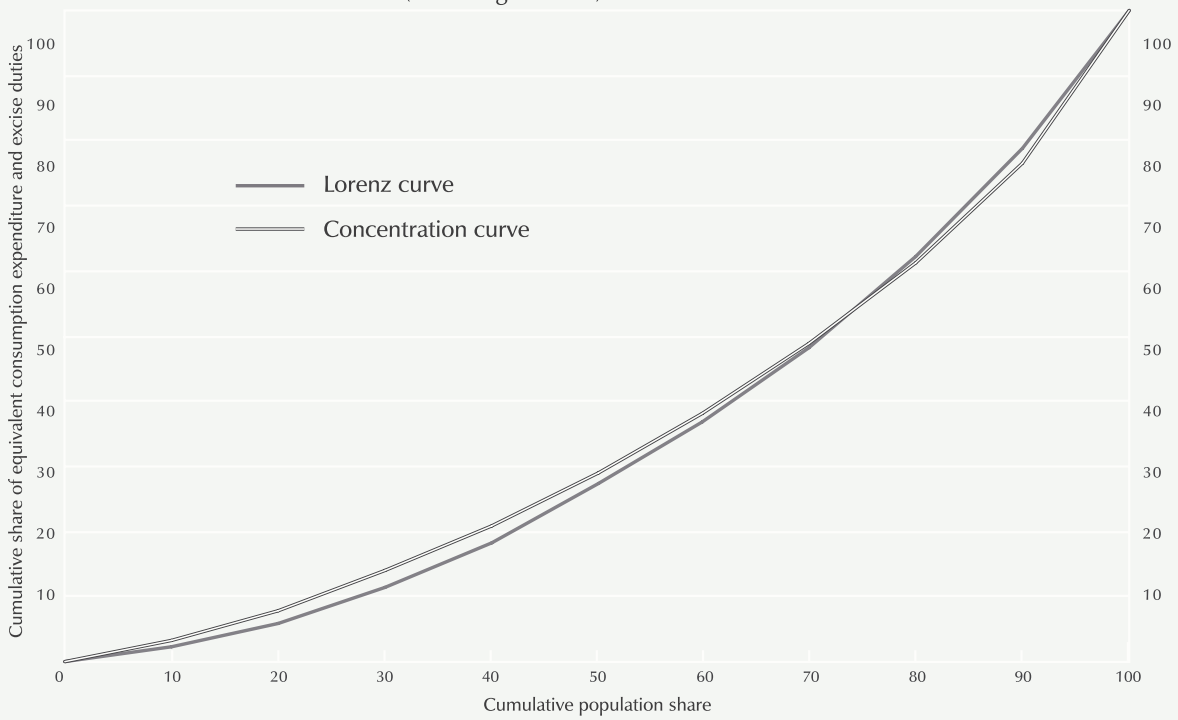
These distributions should be interpreted as follows: the HBS records the expenditure of each household for the acquisition of goods and services, including excise duties. However, households do not derive utility (at least not directly) from the taxes they pay. Their welfare level, calculated in money terms, is determined by the level of their consumption expenditure, with taxes deducted. That is, the distribution of welfare is approached by using the distribution of consumption expenditure excluding taxes, while the distribution of consumption expenditure, including taxes, represents the welfare level that households would reach if these taxes were abolished. Therefore, in order to estimate the distributional impact of an excise duty, we should compare the level of inequality in the distribution of welfare as it is now (columns (2)-(6)) and the inequality level that would result if this tax did not exist (column (1)). Thus, from the comparison of each of the columns (2), (3), (4) and (5) with column (1) we derive the distributional impact of the excise duty on alcoholic drinks, tobacco products, heating and transportation fuels, while a comparison of column (1) with column (6) provides an estimate of the overall distributional impact of excise duties. If the estimates of the inequality indices in columns (2)-(6) are greater/smaller than those in column (1), we conclude that the distributional impact of the corresponding excise duty is regressive/progressive.

Estimates in column (2) show that excise duties on alcoholic drinks have an insignificant distributional impact. This result is probably to be expected, if one takes into account the low prices of the equivalent excise duties presented in Table 3. The comparison of the upper parts of columns (1) and (2) in Table 5 suggests that, *ceteris paribus*, and because of the excise duty on alcoholic drinks, the consumption expenditure shares of the 2nd, 5th, 8th and 10th decile increase, while they decrease for the other deciles. In quantitative terms, these changes are very limited. In the lower part of column (2) inequality indices are almost unaffected by the excise duty, even though it should be said that there is an imperceptible reduction of the inequality (changes in indices become apparent only at the fifth or sixth decimal place).[16]

In contrast to the negligible distributional impact of consumption taxes on alcoholic drinks, as shown in Table 5, column (3), the impact of excise duties on tobacco products seems to be significant and very regressive. As a result of the imposition of these taxes, the consumption shares of the six lowest, and the 8th, deciles, decrease, while they increase for the other deciles. All

16 This progressive character becomes apparent with the use of cumulative shares of equivalent consumption expenditure (Lorenz curve) and the equivalent excise duties (concentration curves). When the concentration curve is closer to the equal distribution line —a line at a 45° angle— than the Lorenz curve, then the taxation burden is more equally distributed than consumption expenditure and, therefore, the welfare level without the excise duty is more equally distributed than the welfare level which includes the impact of the excise duty. In alcoholic drinks, the excise duty is more unequally distributed than consumption expenditure and, therefore, this tax is progressive.

Chart 3
Lorenz curve for the distribution of equivalent consumption expenditure and concentration curve of excise duties for all commodities (excluding vehicles)



Source: Calculations based on micro-data from the 1993/94 Household Budget Survey of NSSG.

indices at the bottom of column (3), Table (5) show significant increase in inequality as a result of excise duties on tobacco products. The increase in inequality ranges from 0.62 per cent, in the case of the less sensitive index (Gini), to 1.34 per cent in the case of the Theil index, which is more sensitive to changes at the upper end of the distribution. Similar, but less dramatic, results appear when we examine the distributional impact of the excise duty on heating fuels (column (4), Table 5). The shares of the first seven deciles, excluding the 5th, are reduced with the imposition of the tax, and all inequality indices, except the Gini index, increase by about 0.25 per cent.

The most pronounced distributional results appear in column (5), are related to transportation fuels and are progressive. *Ceteris paribus*, the imposition of tax on transportation fuels reduces the share of the five highest deciles in total consumption and increases the share of the others (in some cases, significantly). As in the previous columns, the Gini index shows the smallest reduction (–0.78 per cent), while the other indices decrease significantly from –1.34 per cent (Theil) to –2.10 per cent (logarithmic variance).

It follows from the above that the data on the overall distributional impact of excise duties are contradictory. Some of them are progressive, while others regressive. The overall distributional impact of the excise duties under examination is shown in the last column of Table 5, as well as in Chart 3. This chart depicts the Lorenz curve of

equivalent consumption expenditure and the concentration curve of the total equivalent excise duty paid by the respective deciles.[17] As a result of these taxes, the shares of the first three deciles in total consumption expenditure increase, but so does the share of the highest (10th) decile. The above are depicted in Chart 3, at the intersection of the Lorenz curve and the corresponding concentration curve.[18] Therefore, some indices suggest a greater inequality in the distribution of total consumption expenditure minus excise duties (real welfare level) than others. Interesting results are derived from a careful examination of the behaviour of various indices. The index most sensitive to changes at the upper end of the distribution (Theil) records a rise in inequality as a result of excise duties, because of the rise in the share of the top decile. By contrast, the values of the indices that are more sensitive to changes at the lower end of the distribution (variance of logarithms, mean logarithmic deviation and Atkinson index for e=2) show a decrease in inequality – due to the rise in the share of the three lowest deciles, especially the bottom one. The other indices (Gini and Atkinson's for e=0.5) change imperceptibly because of excise duties.

At this point, it is interesting to attempt some verification, as well as an alternative quantification, of the previous findings, using the technique of the decomposition of aggregate inequality by commodity group of expenditure. For this purpose, we isolate, from households' total expenditure, expenditure for excise duties on alcoholic drinks, tobacco products, heating fuels and transportation fuels. The results of the decomposition of total expenditure by group of expenditure, according to equation (9), are given in Table 6.

The first column of the table describes the various excise duties, while the second column provides the percentage share of each excise duty in total consumption expenditure. On the basis of these data, the percentage of total expenditure for excise duties is 3.65 per cent. This is derived mainly from excise duties on transportation fuels (1.82 per cent) and tobacco products (1.45 per cent); the share of excise duties on heating fuels and alcoholic drinks is 0.33 per cent and 0.05 per cent, respectively. The next four columns of Table 6 depict the estimates of the weighting coefficients of each excise duty in the formation of aggregate inequality. As presented analytically above, the greater the share of the particular expenditure, the greater its contribution to aggregate inequality. Excise duties as a whole, depending on the degree of aversion to inequality, are said to have a share between 3.66 per cent and 4.10 per cent of aggregate inequality – slightly higher than their share in total consumption expenditure (3.65 per cent). More than two thirds of this contribution is ascribed to excise duties on transportation fuels, while excise duties on tobacco products account for another quarter. The contribution of excise duties on transportation fuels to aggregate inequality (2.59 per cent) is higher than their share in total expenditure (1.82 per cent). The same holds true for all excise duties together, while the opposite holds true in the case of excise duties on tobacco products and

17 The Lorenz curve depicts the cumulative population share of the deciles relative to their corresponding share of consumption expenditure. The concentration curve depicts the same population share relative to the cumulative share of excise duties.

18 Therefore, the Lorenz curves of the distribution of total expenditure, with and without excise duties, also intersect. However, because of the small changes, in absolute figures, of the deciles' shares, when these curves are depicted in the same chart, they appear almost to coincide; thus, these charts are not presented here (but, if requested, are available from the authors).

Table 6

Share (percentages) of excise duties (excluding those on vehicles) in total consumption expenditure and aggregate inequality, and elasticities of Gini coefficient with respect to excise duties

Excise duties	Share of excise duties in total consumption expenditure w_i	Factor inequality weight in aggregate inequality $w_i g_i$				Elasticity of Gini coefficient with respect to the change in excise duties e_i			
		Value of "inequality aversion" parameter (u)				Value of "inequality aversion" parameter (u)			
		u=1.5	u=2	u=3	u=4	u=1.5	u=2	u=3	u=4
Alcoholic drinks	0.05	0.06	0.06	0.06	0.06	0.0001	0.0001	0.0001	0.0001
Tobacco products	1.45	0.81	0.91	1.03	1.10	–0.0063	–0.0053	–0.0042	–0.0035
Heating fuels	0.33	0.19	0.20	0.22	0.23	–0.0014	–0.0013	–0.0011	–0.0011
Transportation fuels	1.82	2.59	2.66	2.71	2.72	0.0077	0.0084	0.0089	0.0089
Total	**3.65**	**3.66**	**3.84**	**4.02**	**4.10**	**0.0001**	**0.0019**	**0.0037**	**0.0045**

Source: Calculations based on micro-data from the 1993/1994 Household Budget Survey of NSSG.

heating fuels. According to equation (8), these results are directly related to the extent of elasticity of inequality indices and to the distributional impact of each excise duty. A rise in a particular excise duty leads to a reduction in inequality when the share of this excise duty in total expenditure is smaller than its contribution to aggregate inequality.[19]

The precise magnitude of the distributional impact of a percentage change in excise duties is given by the elasticities presented in the last four columns of Table 6. The estimates of elasticities show that, *ceteris paribus*, a rise in excise duties on tobacco products and heating fuels leads to a rise in aggregate inequality in the distribution of consumption expenditure. Specifically, a 10 per cent rise in excise duties on tobacco products and heating fuels will lead to an increase in the Gini coefficient —depending on the value of the inequality aversion constant— of 0.063 per cent-0.035 per cent and 0.014 per cent-0.011 per cent, respectively. By contrast, a 10 per cent rise in excise duties on transportation fuels will reduce aggregate inequality by 0.077 per cent-0.089 per cent. The result in the case of a rise in excise duties on alcoholic drinks[20] goes in the same direction, but is significantly smaller (0.001 per cent).

According to the results in Table 6, the overall distributional impact of excise duties is especially sensitive to the value of the inequality aversion parameter. However, the results of the inequality decomposition technique show that a uniform proportional rise will probably lead to a reduction in aggregate inequality. It is estimated that a 10 per cent increase will reduce the Gini coefficient, depending on the value of the aversion parameter, from 0.001 per cent to 0.045 per cent. Given the relatively higher tax burden of middle incomes, the size of contribution of all excise duties to aggregate inequality varies significantly, depending on the sensitivity of the inequality index to transfers of different types. It is interesting to observe, however, that the results of Table 6 are qualitatively in agreement with those in Table 5. Specifically, as the inequality aversion parameter increases, the overall distributional impact of excise duties appears to be increasingly progressive.

On the basis of the previous findings, we can estimate the distributional impact of the 1998 reduction of excise duties on heating and transportation fuels. Indeed, on the basis of the elasticity estimates in Table 6, the 7.21 per cent reduction of excise duties on transportation fuels (gasoline) from 111 to 103 drachmas per litre in September 1998 increased aggregate inequality in the distribution of consumption expenditure by between 0.055 per cent and 0.064 per cent (depending on the value of the inequality aversion constant). By contrast, the reduction of excise duties on heating fuels (petroleum) by 28.57 per cent, from 28 to 20 drachmas, in October 1998 reduced aggregate inequality by between 0.040 per cent and 0.031 per cent. As an overall impact, the positive effects of the reduction in aggregate inequality through the reduction of excise duties on heating fuels were more than offset by the negative effects of

19 Put in another way, this means that, in the framework of this analysis, taxes must be treated as negative income.

20 It should be stressed that these results ignore any secondary effects, such as changes in households' consumption patterns arising from a lower or higher tax burden, assuming that all other factors remain constant. Of course, such a hypothesis is not realistic, especially when there are big changes in excise duties and the relevant goods are highly demand-elastic relative to price.

an increase in inequality through the reduction of the excise duty on transportation fuels. Therefore, the overall impact is negative, since aggregate inequality seems to have increased by between 0.015 per cent and 0.033 per cent.

5. Conclusions

In contrast to most EU Member States, indirect taxes have traditionally been the main source of fiscal revenue in Greece. Their share in the state's total tax revenue approaches two thirds. Moreover, within indirect taxation, the role of excise duties was and remains important, since they contribute about one third of total revenue from indirect taxes. Despite their importance, the distributional impact of excise duties had not been systematically studied, even though it is often asserted in public debates that these taxes are regressive.

The empirical results of our study, based on data from the 1993/94 HBS, dispute the above assertion. Our results suggest that the overall distributional impact of excise duties in the four commodity groups examined —heating fuels, transportation fuels, alcoholic drinks and tobacco products— is more complex. These taxes put a disproportionately heavy burden on middle incomes, while the relative contribution of the three lowest deciles, and the top decile, to total excise duties is smaller than their share in total consumption expenditure.

It follows from the analysis that the distributional impact of excise duties is, on the whole, progressive. Results are clearer for the excise duties on the commodity groups included in our analysis. The distributional impact of excise duties on alcoholic drinks consumed at home is progressive but quantitatively negligible. In contrast, the impact of the excise duty on tobacco products was found to be quantitatively important but clearly regressive. The impact of the excise duty on heating fuels was also found to be regressive. The most progressive and quantitatively important excise duty was the one imposed on transportation fuels used by private vehicles.

As was previously remarked, a number of excise duties were left out of our analysis. Thus, the picture we presented could be, to some extent, "biased". What is the possible impact of the other excise duties on the welfare of the population? An answer to this question may be given by examining the possible income elasticities of demand for the goods excluded from, or insufficiently examined in, our study.

The bulk of the excise duties which were left out of our analysis are those imposed on vehicles. Since the income elasticity of demand for private vehicles is very high (Mergos and Donatos, 1989) and the structure of consumption taxes imposed on them is progressive (with higher tax rates imposed on more expensive cars with more powerful engines), these taxes are expected to impose a heavier burden on the richest households and the distributional impact is anticipated to be intensely progressive. On the other hand, since public transportation services are marked by low income elasticity of demand, the corresponding consumption taxes on public transportation vehicles and on the fuels they consume probably have a regressive distributional impact.

Two problems arise in connection with excise duties on alcoholic drinks. The first concerns the

deliberate declaration of lower than actual consumption by the households sampled in the HBS[21] and the second is associated with the fact that alcoholic drinks consumed in restaurants, bars etc. are not included in our analysis. Regarding the first of these problems, any connection between the degree of underreporting on the part of the people sampled in the HBS and their welfare level (equivalent consumption expenditure) is particularly questionable. Therefore, in all likelihood, the results of the study are valid, but, if actual consumption of alcoholic drinks at home had been taken into account, the distributional impact of relevant excise duties would have appeared to be more progressive. As regards the second problem, the reasonable assumption that the consumption of food and drinks out of home is a habit with a high income elasticity of demand supports the conclusion that excise duties on alcoholic drinks have a more progressive distributional impact than shown in the tables of the present study.

Concerning the two regressive excise duties presented analytically —on tobacco products and heating fuels— our results are very strong. There is still the possibility of deliberately lower declared consumption of tobacco products (to a far lesser degree than for alcoholic drinks). For reasons similar to those mentioned in the case of alcoholic drink consumption, it is quite probable that the distributional impact of excise duties on these products would appear more regressive if the HBS consumption expenditure data were closer to those in the national accounts.

Finally, in the case of excise duties imposed on intermediate goods, such as commercial vehicles and the transportation and heating fuels used by enterprises in the production of final goods, it is difficult to decide on the extent of the distributional impact.

In conclusion, the picture emerging from our study is not at all "biased", and if there is a certain "bias" in our estimates, this may be in the direction of underestimation of the overall progressiveness of excise duties in Greece.[22] The reference, in public debate, to the regressiveness of excise duties seems to be correct only in the case of tobacco products and heating fuels.

The study's findings can be utilised in the framework of tax policy planning. It is true that indirect taxation is imposed for a variety of reasons and, in many cases, its distributional impact is not the government's primary concern. For example, the 1998 and 1999 reductions of excise duties on petrol and heating fuels were aimed at reducing inflation. Given the fact that indirect taxes will continue to play an important role in the future, their distributional impact must always be carefully studied. Within these bounds, this study illuminates a few crucial issues and suggests changes in existing excise duties that could lead to a reduction in inequality. Moreover, the present study provides an analytical framework that can be

21 The underestimation of spending on alcoholic drinks and, to a lesser extent, on tobacco products is a common feature of several HBSs, independent of the country in which they are conducted (Atkinson *et al*. (1990).

22 It should, of course, be stressed that these conclusions could have been different if, instead of using equivalent consumption expenditure as households' welfare index, we had used in our analysis their equivalent income and if, moreover, there were a significant concentration of total savings at the upper end of the distribution. An analysis on the basis of the income data showed that, in this case, the ranking of excise duties according to their relative progressiveness does not differ from the one described in the previous parts of this study; however, total progressiveness of excise duties appears to be significantly reduced.

adapted and help in examining the impact of other economic policies on aggregate inequality. The same analytical framework can be used to study the distributional impact of the change in the VAT rates for particular categories of goods, as well as to study the quantification of the distributional impact of direct taxation policies (change in tax-exempt income ceilings, index-linking of tax brackets to inflation etc.).

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ECB monetary policy strategy and macroeconomic volatility in Greece[1]

Harris G. Dellas
University of Bern

1. Introduction

Central banks around the world use a variety of strategies to implement their monetary policy. In particular, there are a number of potential targets which can and have been used in the pursuit of final goals. These include monetary targeting, interest rate targeting, nominal income targeting, exchange rate targeting and, more recently, inflation targeting. In the years following the influential article of Poole (1970), many central banks reoriented their monetary policy strategies to focus more on interest rates and less on monetary aggregates. The rapid restructuring of global financial markets was thought to have led to instability in standard monetary relationships, and Poole's basic insight suggested that a central bank would have better control of the economy if it targeted the nominal interest rate instead of a monetary aggregate. At about the same time, asymmetries in inflation performance and inflation tolerance across countries led to the demise of the Bretton Woods system of fixed exchange rate parities. Both developments were associated with the desire of policy makers to achieve greater control over macroeconomic performance. Nevertheless, by the late 1970s it had already become clear that neither interest rate targeting nor a system of flexible exchange rates could necessarily contain excessive volatility in output and inflation. Since then, central bank practices have varied considerably both across countries and within the same country over time.

1 This article was written in the context of my collaboration with the Bank of Greece as a visiting researcher. I am grateful to Heather Gibson for many valuable suggestions. The views expressed in this article are those of the author and not necessarily those of the Bank of Greece.

The issue of the appropriate monetary strategy has never left centre stage in monetary economics. New theories and practices (or new ways of implementing old practices) are constantly being developed. For instance, nominal income targeting has received a great deal of attention lately as a result of McCallum's successful demonstration of its technical feasibility (see also Canzoneri and Dellas, 1998). Another —more radical— development regards the recent proposals to drop intermediate targets altogether and target inflation directly.

The targeting strategy debate has recently intensified following the decision to establish a European Central Bank (ECB). There existed differences of opinion among current and perspective EMU participants concerning which strategy would produce the best outcomes for price and output stability. Germany had long favoured monetary targeting (which performed satisfactorily for the Bundesbank), while other countries (such as Spain, Finland, Sweden and the United Kingdom) had a preference for inflation targeting. The outcome which was announced in the fall of 1998 was for the adoption of a system which is a mixture of both monetary and inflation targeting. To this end, a reference value (rather than a strict target) of 4.5 per cent for 1999 was set for M3 and the ECB considered this to be consistent with price stability, that is an annual inflation rate that does not exceed 2 per cent. An additional issue –which may shift to centre stage in the future— concerns the external parity of the euro and in particular whether it should be the subject of direct or indirect targeting.

The Greek economy will be affected by the actions of the ECB as it is closely linked to the euro both in the short and the long term. In the short run, the euro/drachma exchange rate will remain within the fluctuation limits set by the drachma's participation in ERM II. In the medium run, Greece is expected to participate in EMU. Consequently, the conduct of monetary affairs by the ECB, and in particular its choice of monetary strategy, may affect economic activity and prices in Greece.

The aim of this article is explore these effects which so far have escaped formal analysis. We start by offering a survey of the theoretical literature on monetary policy strategy, examining the advantages and disadvantages of various alternatives. We then proceed to evaluate the implications of the suggested alternative ECB targeting strategies (money and inflation) for output and inflation stability in Greece both during the current ERM II phase and also after Greece has been admitted into EMU. The objective is not only to determine qualitatively the implications of alternative strategies but also to calculate quantitatively any associated trade-offs.

The key finding is that alternative ECB monetary policy objectives involve a trade-off between inflation and output volatility in Greece. Strict ECB inflation targeting is more satisfactory for inflation but less satisfactory for output variability, compared to strict money targeting.[2] This trade-off is due to the importance of supply shocks for the Greek economy. It should be noted, however, that the attractiveness of inflation targeting may increase if the demand for the euro proves less stable than the demand for the Deutschemark.

2 Similar results concerning the existence of a price-output variability trade-off associated with inflation targeting have been obtained for Australia (Stevens and Debelle, 1995) and the USA (Cechetti, 1998).

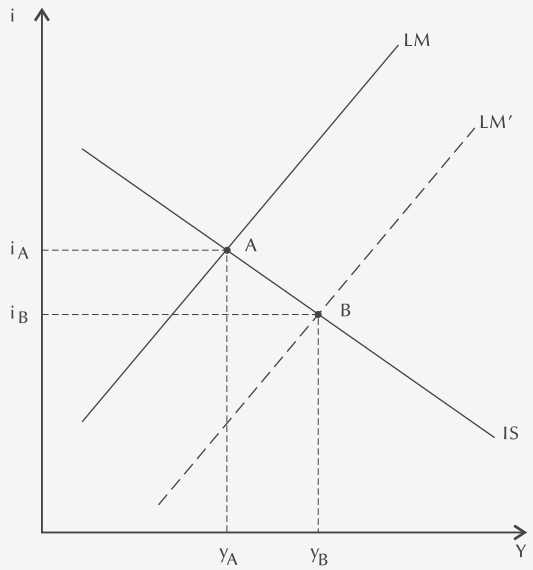
In this paper, the analysis of targeting procedures has been done in a uni-dimensional fashion in order to draw out the differences as starkly as possible. In other words, we have assumed that the central bank pursues a single target, paying no attention to anything else. In reality, though, targeting tends to be conducted in a more flexible fashion (see Section 2.II). For instance, a central bank may allow for deviations from target values, use a combination of intermediate targets, change the weights as economic conditions change and so on. This implies that the differences documented below under perfectly rigid targets (money or inflation) may be considerably less pronounced in reality. Nevertheless, one may still use the results of this paper to form an idea of what would happen to the variability of prices and output in Greece if the ECB were to opt for a flexible use of combined monetary and inflation targeting.[3]

2. Literature review

I. The traditional approach

The modern literature on monetary policy strategy is based on the seminal contribution of Poole (1970). In Poole, the central bank is exclusively preoccupied with output stability, as the economy exhibits perfect price rigidity and thus inflation is not an issue. The goal therefore is to minimise output variability, and the intermediate targets which the central bank has at its disposal include smoothing variations in nominal interest rates or keeping money supply growth within a pre-specified narrow range. Which of the two is preferable depends on the types of shocks the economy is likely to face, yet the central bank does not know for sure what kind of shocks will occur in practice. Two types of disturbances are considered: one originates in the market for money (a velocity shock) and the other in the market for goods (an expenditure shock). Poole's key conclusion was that the optimal strategy was shock-specific. Nominal interest rate targeting fared better —in terms of output stability— when the main source of macroeconomic volatility was found in the market for money (velocity instability). If, on the other hand, output instability was mostly caused by expenditure shocks (such as fiscal, consumption and investment shocks), then the central bank ought instead to target the money supply.

Chart 1
Velocity shock

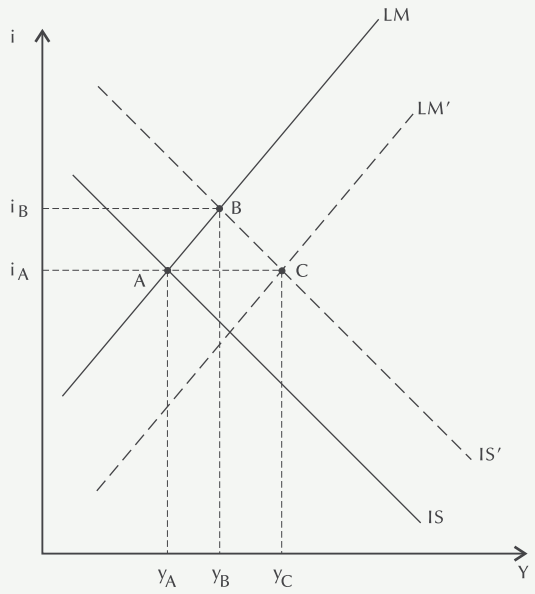


The intuition behind this result is easily seen by considering a simple IS-LM diagram. In Chart 1, there is a positive velocity shock —such as the greater use of credit cards— which shifts the LM

3 For a relatively recent discussion, see Svensson, 1999.

Chart 2

Fiscal disturbance



curve to the right (LM′), putting downward pressure[4] on interest rates (from point A to point B and i_A to i_B). If the central bank targets interest rates, it will try to push them back up by contracting the money supply, thus shifting the LM curve back towards its original position. With a perfectly rigid interest rate target, there is no effect on output. If, on the other hand, the object of targeting is the supply of money, the central bank will let interest rates drop. As a result, output expands from Y_A to Y_B. Output variability is thus minimised if money market shocks are common.

Chart 2 describes the effects of a fiscal disturbance (an expenditure shock) on output stability. An increase in the budget deficit shifts the IS curve out (to IS′), pushing interest rates up (from i_A to i_B). Under money targeting, the monetary authorities do not react to the change in the interest rate and point B represents the new equilibrium of the economy. In this case, income rises somewhat to Y_B. Interest rate targeting, on the other hand, requires that the central bank expand the supply of money in order to prevent interest rates from rising (the LM curve shifts to the right to LM′). The new equilibrium is at point C. As a result, under interest rate targeting and expenditure shocks, monetary policy is conducted in a procyclical manner, exacerbating output fluctuations.[5] By contrast, monetary targeting minimises output variability in this case.

It is straightforward to study the implications of exchange rate targeting within this model. The uncovered interest rate parity condition (UIRP) states that

$$(1) \qquad i_t - i_t^* = \log[z_{t+1}/z_t]$$

where i_t and i_t^* are the domestic and foreign nominal interest rates respectively and z_t is the exchange rate.

Equation (1) shows that targeting the rate of change in the nominal exchange rate (say, at the level k, where k=0 for a perfectly fixed exchange rate target) is equivalent to targeting the domestic nominal interest rate at the level $i_t = i_t^* + k$.

4 By assumption, the central bank can observe contemporaneous changes in interest rates but not the current state of economic activity. In the unrealistic case that it could observe output developments immediately, it would be able to infer the type of shock and hence formulate policy accordingly.

5 Obviously, the slopes of the IS and LM also matter significantly for the optimal choice of strategy. For instance, a money demand that is very unresponsive to changes in the nominal interest rate —a steep LM— creates a strong presumption in favour of interest rate targeting independent of relative shock volatility. While we are abstracting from this issue throughout the discussion of the literature, it should be kept in mind that it will play a key role in the empirical analysis.

Moreover, in order to defend the external parity of the national currency, the domestic monetary authorities must respond, in addition to domestic disturbances, to foreign aggregate demand shocks. Foreign shocks influence domestic economic conditions either through the goods market (by changing foreign demand for domestic exportables) or the money market (through shifts in the world interest rates). Obviously, whether exchange rate targeting is a good idea depends — as before — on the relative variability of different shocks (IS versus LM). In addition, the relative variability of domestic and foreign shocks matters too. Pegging one's currency to the currency of a country that is subject to relatively substantial economic turmoil is likely to prove destabilising. By contrast, if the foreign country is stable, then exchange rate pegging may be beneficial.

The analysis of Poole is very simple and intuitive and it leads to clear, unambiguous results. But it is not complete. First, because of its assumption that prices are perfectly fixed, it is silent on the issue of the relationship between monetary policy strategies and price stability. This is a critical omission as price stability is nowadays the chief objective of monetary policy. And second, it is exclusively pre-occupied with aggregate demand shocks, which may be an important source of macroeconomic variability but are by no means the only source.

These two shortcomings were addressed in subsequent work by Canzoneri, Henderson and Rogoff (1983), who used the then popular rational expectations, imperfect information and perfect price flexibility macroeconomic model. Their key finding was that the basic insights of Poole concerning demand shocks survived intact. On the other hand, the relationship between the properties of targeting strategies and supply shocks turned out to be ambiguous depending on the interest elasticity of private expenditure (c). (We illustrate this formally in Appendix 1). If $c>1$, then the aggregate demand schedule is flatter under interest rate pegging compared to money supply targeting. The flatter the aggregate demand curve is, the larger the output effect of a supply shock. The opposite is true if $c<1$. Hence, money targeting insulates the economy better against supply shocks when $c>1$, while it fares worse when $c<1$.

Concerning price stability under demand shocks, the picture is similar to that drawn for output stability, because demand shocks affect prices and output in the same direction (they are positively correlated). That is, if a strategy increases the volatility of output, then it also contributes to greater price instability. Interest rate targeting minimises the volatility of aggregate demand (and hence of both prices and output) for velocity shocks, while it leads to greater aggregate demand volatility (and hence more unstable output and prices) for fiscal shocks (relative to monetary targeting). For supply shocks, on the other hand, the relationship between economic activity and the general price level is negative. As a result, a central bank monetary policy strategy that gives the greatest benefits in terms of output stability will carry the greatest cost in terms of price instability. This is a feature that will play a prominent role in the analysis of macroeconomic variability in Greece.

Finally, the implications of an exchange rate target can be similarly deduced. It must be kept in mind that, in addition to the relative variability of

different types of shocks (fiscal versus financial) emphasised in a closed economy, the relative volatility of shocks originating in different countries (domestic versus foreign) is also crucial. An exchange rate target is conducive to greater stability if the main source of the business cycle is found in the domestic financial markets. This is due to the fact that targeting the exchange rate is similar to targeting interest rates.

II. The modern approach

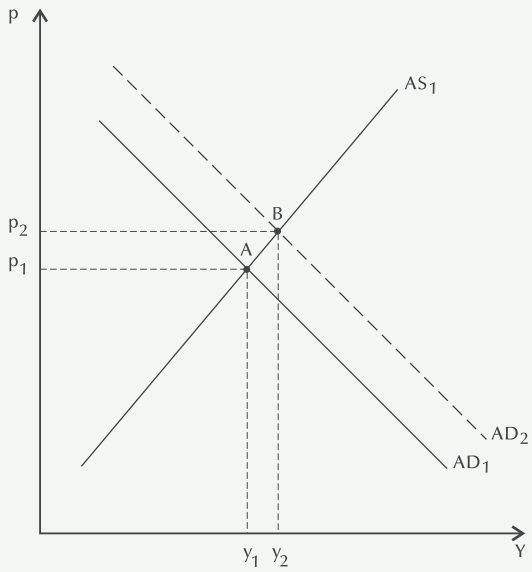
The earlier literature offered important insights into the macroeconomic implications of alternative monetary policy strategies. It did not, however, address two important issues. The first concerns how the issue of credibility affects the choice of operating procedure. The second concerns the optimality of relying on an intermediate target when the central bank's ultimate objective is to achieve price stability. Both these issues have played a prominent role in the development of the theory of direct inflation targeting.

Broadly speaking, inflation targeting has two characteristics (Bernanke and Mishkin, 1997): first, the acknowledgment that low and stable inflation is the primary and overriding goal of monetary policy; and, second, the announcement that the central bank will aim in the future to hold inflation within a certain range, perhaps at or near a single number. We discuss later whether these elements are completely new — so that inflation targeting represents a radical departure from existing practices — or whether they are already more or less an integral part of monetary practices.

The operation of inflation targeting in a credible regime is quite straightforward, at least in theory.

Chart 3

Aggregate demand shock

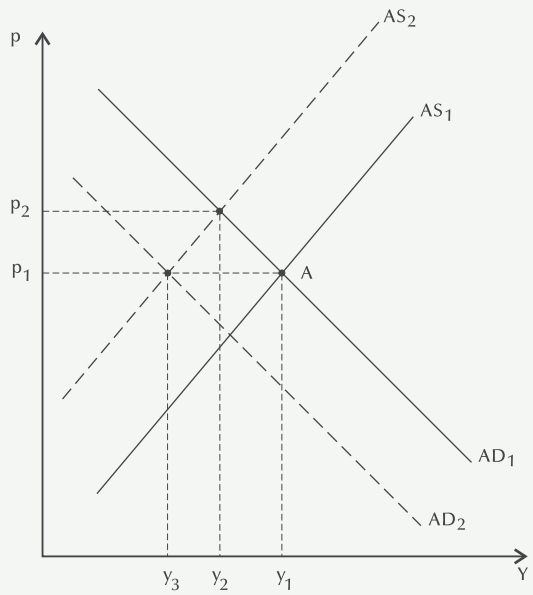


Consider a standard aggregate demand (AD) – aggregate supply (AS) diagram (Chart 3) with initial equilibrium prices P_1 and output Y_1. A positive aggregate demand shock shifts the AD1 curve to the right (to AD_2), putting upward pressure on both prices and economic activity. Under monetary targeting, the monetary authorities do not react to this shock and the economy ends up at point B, with higher prices (P_2) and output (Y_2). By contrast, under inflation targeting the central bank must prevent the aggregate demand schedule from moving to the right (keeping the economy at point A), by tightening up monetary policy. In this case, monetary policy is conducted in a counter-cyclical fashion and clearly dominates money targeting as it achieves greater price stability and is also accompanied by greater output stability.

The picture is quite different for supply shocks

Chart 4

Aggregate supply shock



(Chart 4). A negative aggregate supply shock shifts the aggregate supply schedule to the left (to AS_2), putting upward pressure on prices and reducing output and employment. The central bank now faces a clear dilemma. If it wants to prevent employment losses, it will have to follow an expansionary monetary policy and thus accept an even higher rate of inflation. If it attempts to lower inflation, it will have to follow a contractionary monetary policy, which would further exacerbate the output loss (perhaps to Y_3). Strict adherence to inflation targeting induces procyclicality in the conduct of monetary policy and may prove quite destabilising.

The above theoretical results are clearcut, because they are based on relatively simple models of the economy. In practice, of course, there are a number of further questions which need to be addressed when deciding whether to adopt inflation targeting.

First, should the central bank target the inflation rate or the price level? A price level target specifies a path for the price level, while an inflation target specifies an inflation target paying no attention to the price level. The difference between these two strategies can be highlighted by considering the following example. Suppose that the price level has been constant for some time and then it suddenly experiences a once and for all upward jump (positive inflation for one period only). Under price targeting, monetary policy must contract to restore the old (targeted) price level, something that requires deflation. Under inflation targeting, no action needs to be taken as the expected inflation rate after the initial jump is zero (price bygones are bygones). Hence, the former strategy achieves greater price level stability but at the expense of more inflation variability relative to the latter.

Second, which inflation measure ought to be targeted? For instance, should it be the Consumer Price Index (CPI) or the GDP deflator? An important question concerns the use of inflation measures that include volatile, cyclical items (core versus general price index) or that are sensitive to once and for all shifts in the price level. Using such measures as a target could actually introduce excessive volatility in the inflation rate.

Third, what is the appropriate time horizon for an inflation target? Should the central bank aim to achieve its target inflation rate only over the medium to long term or should it also set short-term targets? Given the lack of predictability/controllability of inflation in the short run (because of the long and variable lags relating monetary policy actions to inflation as well as the uncertainty of the inflation process), it may be

sensible to focus only on long-term price stability.

Fourth, what is the appropriate target level? Should it be a single number or a range? Concerning the first point, it has been argued that the inflation target ought to be low but not too low in order to allow for real wage adjustment in the presence of aversion to nominal wage cuts (and also in order to allow for negative real interest rates). Often, real wage changes occur via changes in the general price level. According to the proponents of this view, a zero target may not allow policy-makers to inflate away the real cost of labour, thus preventing changes that are needed in order to restore full employment.

Concerning the second point, it is clear that there is a trade-off between the range of the inflation target and potential credibility gains. A wide band makes satisfaction of the target easier (because of the great uncertainty that exists concerning non-policy induced inflation developments), but at the same time it may make the public and the markets doubt the commitment to price stability, since it allows the central bank more leeway.

Fifth, should inflation targeting be conducted as a strict rule or should it be perceived only as a framework for the conduct of monetary policy? In the former case, the monetary authorities are not allowed to pursue short-term stabilisation activities alongside long-term price stability. Under the latter, the monetary authorities maintain some degree of flexibility in the short run in pursuing objectives other than absolute price stability. Naturally, this question boils down to the evaluation of the relative merits of rules versus discretion. Proponents of inflation targeting as a rule worry about the time inconsistency problem and the resulting inflation bias that may be associated with discretionary policy.[6] Proponents of inflation targeting as a general framework tend to believe that time inconsistency-credibility problems have been rather exaggerated.

Finally, is there any role left for intermediate targets (money supply, interest rates, the exchange rate, etc.) under inflation targeting? Proponents of inflation targeting argue that such variables are useful but only to the extent that they can be used to forecast future inflation.

Let us now turn to the evaluation of the merits (and weaknesses) of inflation targeting. It has been claimed that inflation targeting brings about greater transparency and coherence in the conduct of monetary policy, as inflation targets are much more easily understood by the public. This implies a clear anchor for inflation expectations, a fact that helps to boost credibility and also reduces the pressure on the central bank to pursue other objectives. At the same time, explicit inflation targeting makes it harder for the central bank to evade its responsibility for price stability because it increases accountability.

Moreover, it has been argued (Svensson, 1997) that, from a theoretical point of view, it is more efficient to target the ultimate goal directly, using

6 A policy is said to be time inconsistent if, at some point in the future, the monetary authorities could face an incentive to renege on it. A policy of zero inflation is time inconsistent, because a negative shock which reduces output gives the authorities an incentive to generate surprise inflation and thus restore output to its previous level. Under such circumstances, no-one will believe a commitment to zero inflation and hence inflation will not actually be zero but some positive amount.

its own forecast as an intermediate target (that is, using the inflation forecast as the intermediate target), rather than relying on any other intermediate variable (such as money) which may or may not[7] have a stable relationship to the ultimate goal.

There are some major shortcomings, though. The fact that the inflation rate is difficult to predict and control relative to other intermediate targets (such as the exchange rate or various measures of the money supply) implies that the central bank may be blamed for inflation developments that are beyond its control. This could end up undermining the credibility of the central bank. Moreover, as argued above, a strict inflation targeting rule may cause greater instability in aggregate activity in countries where the main source of macroeconomic variability is found on the supply side of the economy (such as Germany, see Canzoneri and Dellas, 1996; Dellas 1997).

Undoubtedly, each strategy has its strong and weak points. Nevertheless, the important practical issue is whether they are associated with dramatically different macroeconomic outcomes. Is inflation targeting going to produce significantly different inflation and output performance relative to a monetary target such as, for instance, the one which has been used by Germany?

It is probably true to say that, for a country (such as Germany) with a high degree of inflation credibility, the particular strategy adopted may not matter very much. This is because the Bundesbank already had a strong commitment to transparency and it communicated its policy strategy to the public via clear public statements. Hence, there were no additional benefits on the credibility front arising from the adoption of inflation targeting. Moreover, the Bundesbank had explicit medium-term inflation goals and undertook monetary targeting more as a monetary framework rather than an ironclad rule. For instance, it might have tolerated higher short-term inflation in order to protect jobs in the short run. Hence, it appears that in practice there is not really that much difference between monetary targeting *à la* Bundesbank and inflation targeting as practiced by other countries (that is, as a monetary policy framework).

The situation may be different for countries that do not enjoy the inflation credibility of the German central bank. In those countries, explicit inflation targeting may serve as a means of improving transparency and accountability and of building credibility. Similar arguments have been used to support an exchange rate target because of the visibility of exchange rates.

What conclusion can be drawn from the survey of the literature on monetary policy strategies? It seems that the implications and hence the optimal choice of a strategy depend: a) on the interpretation of the strategies (whether the central bank follows a rule or employs a more general framework); b) on the relative frequency and size of various shocks (aggregate demand versus aggregate supply, velocity versus fiscal, domestic versus foreign); and c) on the credibility

7 It is well known that velocity has been very unstable and unpredictable in most industrial countries, a fact that implies that changes in monetary growth rates may not be good predictors of inflation. In addition, the lack of controllability of broad aggregate money measures implies that inflation is also less controllable under a money target.

enjoyed by the monetary authorities. Only by studying a particular economy may one be able to offer an unambiguous country-specific evaluation of the merits of alternative strategies.

3. Implications for Greece

In this section, we study the implications of the ECB targeting strategy for output, inflation and terms of trade stability in Greece. We consider two distinct cases: a unilateral drachma/euro peg within the framework of ERM II, as will be the case up until Greece joins EMU; and Greek participation in EMU. Two ECB strategies are considered: money supply and direct inflation targeting. As noted above, the ECB has decided on a mixture of these two and thus our results here are only indicative, since we examine each separately. This gives us four distinct regimes: (i) pegged exchange rate with the ECB targeting money; (ii) pegged exchange rates with the ECB targeting inflation; (iii) Greece in EMU with the ECB targeting money; (iv) Greece in EMU with the ECB targeting inflation. The objective of the exercise is to gain some idea of what alternative ECB strategies have in store for the Greek business cycle during the transition to EMU (that is under a drachma/euro peg within the framework of ERM II) and also once Greece has been admitted into EMU.

Our evaluation of alternative strategies is based on a dynamic, general equilibrium, two-country —Greece and a "foreign" country (the euro area)— model with fixed nominal wages and flexible prices (a brief description of the key features of the model appears in Appendix 2). There exist two alternative methodologies for carrying out the task outlined above. The first is the standard econometric approach and involves estimating the model (either in its non-linear or in a linearly approximated form) and then using the estimated equations to conduct various policy experiments pertaining to the alternative strategies. The second involves the —numerical— derivation of the solutions to the maximisation problem as a function of the parameters of the model, the assignment of particular values to these parameters and then the stochastic simulation of the model. In this article we have opted for the latter approach, because the data requirements for the first approach are not met for Greece.

We are interested in knowing the effects of alternative targeting rules for the variability of economic activity (output), inflation and the terms of trade. The model described in brief in Appendix 2 gives rise to solutions for —detrended— output, the inflation rate and the terms of trade in Greece that take the following form:

$$(2) \qquad y_t = f(s_t, s_t^*, w_t)$$

$$(3) \qquad p_t = g(s_t, s_t^*, w_t)$$

$$(4) \qquad q_t = n(s_t, s_t^*, w_t, w_t^*)$$

$$\text{with} \qquad s_t = \{u_t, v_t, e_t\},\ s_t^* = \{u_t^*, v_t^*, e_t^*\}$$

where y_t, pt and q_t are —detrended— output, inflation and the terms of trade in Greece in period t, f, g and n are linear functions, u_t, v_t and e_t are the Greek supply, velocity and fiscal shocks and w_t is the growth rate of the Greek money supply. An asterisk (*) identifies the corresponding

foreign variables.[8] We have used a weighted average of the relevant German and French variables to construct the foreign variable. The foreign supply of money is chosen endogenously in order to meet the postulated policy target of the ECB. That is,

$w_t^* = w^*$ under monetary targeting
$p_t^* = p^*$ under a constant inflation target (which determines w_t^*)

where p* is the inflation target of the ECB and w* the ECB's money growth target. For simplicity, we abstract from issues of target controllability, uncertainties about meeting the target and so on.[9]

The Greek supply of money before Greece's participation in EMU is selected in order to satisfy an exchange rate target. For simplicity, we will assume a perfectly rigid parity:

$z_t = z$ (which determines w_t)

We will also assume that either the system enjoys perfect credibility or the probability of a devaluation of a given size is constant.

Tables 1A-1D contain information on how Greek output, inflation and the terms of trade respond to the six exogenous shocks (that is, they are based on equations (2), (3) and (4)). The response of these variables to the contemporaneous shocks gives the impact multipliers — in the form of elasticities — while the impact effects combined with lagged ones can be used to derive the dynamic path of the variable of interest, following a specific shock (the impulse response functions). As can be seen, the impact effects are intuitively plausible. For instance, consider the coefficients for the current shocks in the y row. As expected, a positive current exogenous improvement in Greek productivity (u>0) always raises output in Greece. On the other hand, the effect of a change in foreign productivity (u*) on Greek economic activity depends on the ECB strategy. Under money supply targeting, an improvement in foreign

Table 1
Elasticities

A. Fixed euro/drachma rate, the ECB targets the money supply

	u	u*	e	e*	v	v*
y	1.42	–0.30	0.22	0.04	0.0	0.71
p	–0.75	–0.17	0.11	0.3	0.0	0.40
q	0.48	–0.25	–0.24	0.21	0.0	0.0

B. Fixed euro/drachma rate, the ECB targets inflation

	u	u*	e	e*	v	v*
y	2.28	0.31	0.12	–0.11	0.00	0.00
p	–0.25	0.17	0.06	–0.06	0.00	0.00
q	0.82	–0.53	–0.21	0.19	0.00	0.00

C. Greece in EMU, the ECB targets the money supply

	u	u*	e	e*	v	v*
y	1.42	–0.03	0.27	–0.005	0.71	–
p	–0.75	–0.02	0.14	0.002	0.40	–
q	0.25	–0.28	–0.24	0.22	0.0	–

D. Greece in EMU, the ECB targets inflation

	u	u*	e	e*	v	v*
y	2.46	0.33	0.12	–0.11	0.0	–
p	–0.17	0.18	0.06	–0.06	0.0	–
q	0.53	–0.56	–0.21	0.19	0.0	–

Note: The entries give the percentage change in the variable in the relevant line (y,p,q) as a result of a particular shock.

8 Note that in the short run, the Greek inflation rate will tend to behave differently from the average European Union inflation rate even under EMU, because of differences in the corresponding consumption baskets (the fact that there is a home bias in consumption). For instance, such regional differences in the behaviour of prices are present in the USA.

9 In practice, central banks target forecast inflation and not actual inflation, because of lags between the exercise of policy and its effects on inflation.

productivity depresses economic activity in Greece. This is due to the fact that, holding the rate of growth of the foreign money supply constant, an improvement in foreign productivity will cause the drachma exchange rate to depreciate: with an exchange rate target, the central bank has to contract the money supply to offset the effect of the shock and maintain the peg. Under inflation targeting, the effect of the foreign productivity shock on Greek output is positive. This is due to the fact that the foreign supply of money must react procyclically to a positive foreign productivity shock in order to maintain the inflation target. As a result, the expansion of the foreign money supply tends to prevent the appreciation of the foreign currency (depreciation of the drachma) and hence the need for a domestic monetary contraction.

Positive fiscal shocks (e, e*>0), whether at home or abroad, are expansionary. Finally, only the foreign velocity shock has an effect on Greek economic activity. The Greek velocity shock is countered by monetary policy in order to prevent any change in the exchange rate, rendering it completely ineffective (as in the model of Canzoneri, Henderson and Rogoff, 1983). The foreign velocity shock, on the other hand, has an important effect on the Greek economy. This is due to the fact that this type of shock would lead to an appreciation of the drachma if left uninhibited. To prevent this from happening, the Greek monetary authorities must react by following an expansionary policy, which ends up stimulating economic activity. The impact multipliers in Tables 1A-1D seem to suggest that the dominant factor —in terms of size— for macroeconomic activity is the supply shock, followed by the foreign velocity shock. Fiscal policy seems to play a secondary role (except for the terms of trade).

In order to gain some insight into the sources of Greek macroeconomic variability, we now turn to Tables 2A-2D. These tables provide information on the relative importance of different shocks (internal versus external, demand versus supply) for macroeconomic variability in Greece under the four regimes.[10] The most interesting features are the following:

• *Supply shocks*: The domestic supply shock (u) is the main source of fluctuations in real output under all regimes. Moreover, its relative contribution is much greater under inflation targeting by the ECB, because in that case foreign velocity shocks are not allowed to affect prices and output. As would be expected, real factors (supply) play a less prominent role in the variability of inflation.

• *Velocity shocks*: Drachma/euro pegging in the context of ERM II requires that domestic velocity shocks are offset. As a result, such shocks will no longer play any role in the determination of output and prices in Greece. Foreign financial shocks matter for the variability of both inflation (both in the short and long term) and economic activity (but only in the short run). Their effect is quite significant in terms of impact and also short-term dynamics but it disappears when the ECB targets European inflation. According to Table 2A, almost one third of short-term macroeconomic

10 The tables present an analysis of variance —the variance decomposition of the forecast error— for the variable of interest (output, inflation and the terms of trade) in terms of the exogenous shocks over different time horizons (1, 4, 8, 20 and 80 years).

Table 2
Variance decomposition

A. Fixed exchange rate, the ECB targets the money supply

Output

Years	u	u*	e	e*	v	v*
1	61.45	1.04	5.74	0.05	0.00	31.72
4	77.21	0.53	7.87	0.03	0.00	14.36
8	82.79	0.32	8.52	0.02	0.00	8.35
20	86.98	0.16	8.81	0.01	0.00	4.04
80	88.83	0.09	8.86	0.00	0.00	2.21

Inflation

Years	u	u*	e	e*	v	v*
1	58.59	1.21	5.70	0.09	0.00	34.42
4	55.97	1.63	5.51	0.09	0.00	36.79
8	55.25	1.64	5.51	0.09	0.00	37.51
20	55.17	1.73	5.53	0.09	0.00	37.48
80	55.31	1.79	5.51	0.09	0.00	37.29

Terms of trade

Years	u	u*	e	e*	v	v*
1	43.52	4.35	42.71	9.41	0.00	0.00
4	69.39	18.37	10.03	2.22	0.00	0.00
8	74.65	18.44	5.67	1.24	0.00	0.00
20	82.87	13.31	3.17	0.65	0.00	0.00
80	90.03	7.25	2.35	0.38	0.00	0.00

B. Fixed exchange rate, the ECB targets inflation

Output

Years	u	u*	e	e*	v	v*
1	97.88	0.69	1.16	0.26	0.00	0.00
4	99.06	0.39	0.45	0.10	0.00	0.00
8	99.31	0.27	0.34	0.08	0.00	0.00
20	99.53	0.14	0.27	0.06	0.00	0.00
80	99.65	0.07	0.24	0.04	0.00	0.00

Inflation

Years	u	u*	e	e*	v	v*
1	68.15	10.45	17.45	3.94	0.00	0.00
4	65.44	12.88	17.69	3.99	0.00	0.00
8	66.21	12.80	17.13	3.86	0.00	0.00
20	65.68	13.58	16.92	3.82	0.00	0.00
80	65.96	13.82	16.49	3.72	0.00	0.00

Terms of trade

Years	u	u*	e	e*	v	v*
1	68.15	10.45	17.45	3.94	0.00	0.00
4	74.42	19.00	5.36	1.22	0.00	0.00
8	77.84	19.32	2.31	0.52	0.00	0.00
20	85.25	13.70	0.86	0.19	0.00	0.00
80	92.24	7.21	0.45	0.09	0.00	0.00

C. EMU, the ECB targets the money supply

Output

Years	u	u*	e	e*	v (=v*)
1	60.32	0.01	8.55	0.00	31.11
4	76.90	0.00	9.18	0.00	13.92
8	80.64	0.00	10.29	0.00	9.06
20	79.56	0.00	14.24	0.00	6.20
80	72.59	0.00	22.05	0.00	5.36

Inflation

Years	u	u*	e	e*	v (=v*)
1	57.85	0.02	8.58	0.00	33.55
4	56.02	0.02	8.22	0.00	35.74
8	55.35	0.02	8.19	0.00	36.43
20	55.96	0.02	8.12	0.00	35.90
80	56.37	0.02	8.05	0.00	35.56

Terms of trade

Years	u	u*	e	e*	v (=v*)
1	17.10	7.68	61.63	13.59	0.00
4	61.48	23.46	12.33	2.73	0.00
8	65.63	25.33	7.41	1.63	0.00
20	66.20	26.83	5.80	1.18	0.00
80	64.30	26.82	7.65	1.23	0.00

D. EMU, the ECB targets inflation

Output

Years	u	u*	e	e*	v (=v*)
1	98.09	0.68	1.00	0.23	0.00
4	98.91	0.48	0.49	0.11	0.00
8	99.00	0.42	0.47	0.11	0.00
20	98.90	0.37	0.60	0.13	0.00
80	98.52	0.36	0.96	0.16	0.00

Inflation

Years	u	u*	e	e*	v (=v*)
1	46.11	19.22	28.28	6.39	0.00
4	49.68	19.62	25.05	5.65	0.00
8	50.04	19.81	24.60	5.55	0.00
20	51.23	20.02	23.45	5.30	0.00
80	51.83	20.32	22.71	5.13	0.00

Terms of trade

Years	u	u*	e	e*	v (=v*)
1	46.11	19.22	28.28	6.39	0.00
4	66.17	25.42	6.86	1.56	0.00
8	69.42	26.84	3.05	0.69	0.00
20	69.70	28.33	1.61	0.36	0.00
80	69.09	28.98	1.59	0.33	0.00

instability in Greece while it pegs to the euro will be caused by instability in European financial markets. It must be noted that in the simulations we have assumed that the velocity shocks under EMU will be similar to those experienced by Germany in the pre-EMU era (that is, of low persistence and volatility). This is what the Bundesbank usually assumes. If European velocity under EMU is less stable than its German counterpart in pre-EMU —as has been widely argued— then the relative contribution of velocity will increase at the expense of that of supply shocks. Note also that almost half of the inflation variability in Greece when it is in EMU will come from European financial markets if the ECB does not react to developments in them (Table 2C).

• *Fiscal shocks*: Fiscal shocks tend to be of modest importance for economic activity but of great significance for the terms of trade. Two interesting patterns emerge from an inspection of the tables. First, most of the impact of fiscal shocks on the terms of trade occurs in the short run. Their effects on inflation, on the other hand, are long-lived (note that they are also smaller than those on the terms of trade). Second, inflation targeting on the part of the ECB acts as a shock absorber in the relationship between fiscal policy and the terms of trade (that is, it reduces terms of trade variability). But this allows fiscal variables to play a more important role in the determination of inflation (the opposite is true for monetary targeting). It should be noted that it is domestic developments —in productivity and fiscal policy— that are responsible for most of the variation in the Greek terms of trade.

Finally, Table 3 presents information on the total variability of Greek output, inflation and the terms of trade in the four cases considered. The values reported are relative to the case with a fixed euro/drachma rate in the framework of ERM II and with the ECB targeting the money supply (which serves as the benchmark). Three main features emerge. First, EMU is associated with slightly greater volatility in Greek economic activity and the terms of trade (relative to a perfectly credible fixed regime). This is due to the fact that there is no longer an independent Greek monetary policy reacting to domestic supply shocks in a stabilising fashion. There is no substantial change in nominal (inflation) variability if Greece moves from a euro peg to membership of EMU.

Table 3
Macroeconomic volatility in Greece
(standard deviations)

	R_1	R_2	R_3	R_4
y	1	1.496516	1.04878	1.581882
p	1	0.307937	1.012698	0.260317
q	1	1.162602	1	1.140921

y= output, p= inflation, q= terms of trade.
R_1: Fixed euro/drachma exchange rate, the ECB targets the money supply.
R_2: Fixed euro/drachma rate, the ECB targets inflation.
R_3: Greece in monetary union, the ECB targets the money supply.
R_4: Greece in monetary union, the ECB targets inflation.
Note: The values in the R_i, i=2,3,4, columns are relative to the R_1 column (that is, the fixed euro/drachma exchange rate with the ECB targeting the money supply serves as the benchmark case). For example, the value 1.49 found in the (y, R_2) box indicates that the standard deviation of output under R_2 is 49 per cent greater than that obtained under R_1.

Second, while strict inflation targeting on the part of ECB produces a decrease in the variability of the Greek inflation rate (relative to monetary targeting), this comes at the expense of higher volatility in Greek output (and modestly higher volatility in the terms of trade). That is, the choice of ECB strategy involves a trade-off between price and output stability. This is due to the fact that supply disturbances play an important macro-economic role in Greece. It must be kept in mind

that the existence and size of this trade-off depends on the predicted stability of the euro financial markets relative to the stability of the pre-EMU German financial markets. This is an issue that has been debated extensively but no clear prediction has yet emerged. If the demand for the euro proved less stable than that for the Deutschemark, then inflation targeting might become a more attractive arrangement.

Third, differences in performance are less pronounced across a perfectly credible pegged drachma/euro regime and a monetary union rather than across ECB strategies (inflation versus money targeting). This is to be expected, since the difference between a completely fixed exchange rate and monetary union is not that great. This implies that the choice of ECB strategy will become a more important issue for Greece once it is already a member of EMU.

4. Conclusions

There exists little doubt that the conduct of monetary policy by the European Central Bank will exert a strong influence on the Greek economy both before and after Greece has been admitted to EMU. In this article we have taken a first step in studying this issue. In particular, we have produced a quantitative assessment of the implications of ECB strategies for macroeconomic volatility in Greece. This evaluation may prove useful in future debates concerning the optimal choice of the ECB strategy.

The key finding is that, because of the presence of important supply disturbances, the choice of the ECB strategy involves a trade-off between inflation and output variability in Greece. Compared to the strict targeting of a monetary aggregate, strict inflation targeting brings about lower price volatility but this comes at the expense of somewhat greater volatility in economic activity.[11] As a result, the ranking of alternative ECB strategies is ambiguous from the point of view of Greece.

11 Recall that similar results have been obtained for other countries, see footnote 1.

Appendix 1: Canzoneri, Henderson and Rogoff (1983)

The standard model from which the results of Canzoneri, Henderson and Rogoff (1983) can be derived is given by:

(A1) $y_t = b[p_t - E_{t-1}p_t + u_t]$

(A2) $m_t - p_t = y_t - ai_t - v_t$

(A3) $y_t = -cr_t + e_t$

(A4) $r_t = i(_t) - [E_{t-1}p_{t+1} - p_t]$

where y, p and m are (the log of) output, the general price level and the money supply respectively, i and r are the nominal and real interest rate, E_{t-1} is an expectation formed in period t-1 and u, v and e are white noise shocks. Equation (A1) is the aggregate supply curve. Equation (A2) is the LM curve and equation (A3) is the IS curve. Finally, (A4) is the Fisher equation. It states that the nominal interest rate is equal to the real rate plus expected inflation.

Suppose that the central bank either targets the money supply (say at $m_t = 0$ for all t) or the nominal interest rate (say at $i_t = 0$ for all t). Under the former policy, y_t is given by:

(A5) $y_{tlm} = [bcv_t + c(1+a)bu_t + abe_t]/(ac + cb + c + ca)$,

while under the latter policy,

(A6) $y_{tll} = [cbu_t + be_t]/(b+c)$

Velocity shocks, v_t, do not enter (A6) at all, a fact that implies that interest rate targeting is very effective in insulating output against money market shocks. It can also be seen that the coefficient of the shock e_t to the demand for goods is larger in (A6) than in (A5). That is, money targeting brings about more stability for IS shocks. Hence equations (A5) and (A6) confirm the analysis of Poole.

Appendix 2

The simulations are based on a standard, two-country model (Greece and the "foreign" country). We give only a brief outline of the main components of the model here. Each country produces a distinct output, which is internationally traded without any restrictions. The production function in Greece and the foreign country respectively is given by:

$$Y_t = A_t(L_tH_t)^a \qquad Y^*_t = A^*_t(L^*_t H^*_t)^a \qquad \text{(B1)}$$

where Y is output, A is a supply shock, L is employment and H represents exogenous, deterministic, technological progress (an asterisk (*) refers to foreign variables). We assume, for simplicity, that the income shares of labour (a) are identical in both countries.

The supply shock follows the AR(1) process

$$\log(A_t) = A + B\log(A_{t-1}) + u_t \qquad -1<B<1 \qquad \text{(B2)}$$

The utility function of Greek residents is given by:

$$W(c_{1t}, c_{2t}) = [1/(1-J)]\{[h\ (c_{1t})^b + (1-h)\ (c_{2t})^b]^{(1/b)} - L_t\}^{1-J} - 1 \qquad \text{(B3)}$$

and that of foreign residents by:

$$W(c^*_{1t}, c^*_{2t}) = [1/(1-J)]\{\ [(1-h)\ (c^*_{1t})^b + h\ (c^*_{2t})^b]^{(1/b)} - L^*_t\}^{1-J} - 1 \qquad \text{(B4)}$$

with $0<h<1$ and where c_{1t} and c_{2t} are the Greek residents' consumption of good 1 (the Greek good) and good 2 (the foreign good), while c^*_{1t} and c^*_{2t} are the foreign residents' consumption of Greek and foreign goods; L and L* are Greek and foreign employment. The utility functions incorporate a "home bias", i.e. Greek residents prefer Greek goods and foreign residents prefer foreign goods.

There is a cash-in-advance constraint motivating the demand for money, which leads to the quantity theory of money:

$$M_tV_t = P_tY_t \qquad \text{(B5)}$$

where M, V, and P are the supply of money, velocity and the general price level in Greece. Thus, the price level in the model is determined by monetary policy (through the level of money supply), financial markets (through velocity) and the level of output.

Velocity, V, follows an AR(1) stochastic process:

$$\log(V_t) = V + D\log(V_{t-1}) + v_t \qquad -1<D<1 \qquad \text{(B6)}$$

The government levies taxes in order to finance public consumption, G_t (the budget is assumed to be balanced in each period). Public consumption follows an AR(1) process:

$$\log(G_t) = G + K\log(G_{t-1}) + e_t \qquad -1<K<1 \qquad \text{(B7)}$$

The stance of monetary policy (reflected either in M or in the interest rate) alongwith fiscal policy (reflected in G) affect Y on the demand side. Equations B2 and B5 to B7 exist symmetrically also for the foreign country. Finally, the exchange rate which emerges from the model is a function of the ratios of money supplies and velocities in the two countries, as well as of the marginal rate of substitution between domestic and foreign goods.

We first assign values to the parameters of the model, using historical data (from the period 1970-1996). We use a weighted average of French and German variables to construct the parameters of the "foreign" economy. We then solve the model using numerical approximation. This produces a solution which takes the form of linearised versions of equations (2), (3) and (4) in the text. The elasticities reported in Tables 1A-1D are simply the coefficients of these equations (note that they represent detrended effects). Simulating these equations, using shocks which come from the probability distribution of the actual shocks, allows us to do the variance decomposition reported in Tables 2A-2D.

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Monetary policy and banking supervision measures

(December 1998 - June 1999)

9 December 1998

— The intervention rate of the Bank of Greece for the acceptance of 14-day deposits is lowered to 12.25 per cent from 12.75 per cent.

— Effective from 10 December 1998, the interest rate for the first tier of the deposit facility is lowered to 11.6 per cent from 11.9 per cent.

— Effective from 10 December 1998, the Bank of Greece Lombard rate is lowered to 15.5 per cent from 16 per cent.

22 December 1998

— Effective from 4 January 1999, the Operating Rules of the "EURO-HERMES" Real-Time Gross Settlement System for Payments in Euro are put into force. Furthermore, the Operating Rules of the "HERMES" Real-Time Gross Settlement System for Payments in Drachmas are approved.

— Effective from 4 January 1999, in the context of operation of the "EURO-HERMES" System, the Bank of Greece offers credit institutions operating in Greece non-interest-bearing intraday financing in euro, on collateral of securities considered eligible by the European Central Bank for the operational needs of the TARGET System.

— With a view to better adapting the domestic foreign exchange market to the conditions which have emerged after the introduction of the euro, a new framework for the operation of the foreign exchange market is laid down, the manner in which the Bank of Greece will perform its duties is specified and the Bank's requirements on credit institutions, as well as the procedure for the control of credit institutions by the central bank are described.

11 January 1999

The terms and conditions concerning the establishment and operation of bureaux de change are updated and codified. In particular, the business scope of these entities is broadened to include purchases of foreign banknotes from authorised banks and/or the Bank of Greece. Bureaux de change are also allowed to debit or credit their foreign exchange accounts with cheques and foreign banknotes, while the data they must keep, the relevant control procedure and the penalties that may be imposed on them are laid down.

12 January 1999

— Effective from 13 January 1999, the intervention rate of the Bank of Greece for the acceptance of 14-deposits is lowered to 12 per cent from 12.25 per cent.

— Effective from 14 January 1999, the interest rate for the first tier of the deposit facility is lowered to 11.5 per cent from 11.6 per cent.

— Effective from 14 January 1999, the Bank of Greece Lombard rate is lowered to 13.5 per cent from 15.5 per cent.

— Effective from 14 January 1999, the rate on credit institutions' overdrafts from their current account with the Bank of Greece is lowered to 20 per cent from 22 per cent.

22 January 1999

— The National Bank of Greece is authorised to establish two branches in Bulgaria, namely one in Burgas and one in Plovdiv.

— The Deutsche Bank is authorised to acquire 10 per cent of the share capital of Eurobank.

— The Bank of Piraeus is authorised to acquire 43.08 per cent of the share capital of the Xiosbank.

28 January 1999

The National Bank of Greece is authorised to take over the branch of the Chase Manhattan Bank established in Bucharest (Romania).

29 January 1999

— With a view to adjusting central bank reporting requirements to those for the conduct of monetary policy in the framework of the European System of Central Banks, credit institutions are required to submit to the Bank of Greece more detailed data on deposit and lending rates.

— With the aim of improving the quality and further enhancing the soundness of banks' loan portfolios, the Bank of Greece establishes a general framework of minimum quantitative criteria for assessing the adequacy of provisions made by credit institutions for claims arising from lending.

25 February 1999

The "Autofin Bank S.A." is authorised to operate in Greece.

2 April 1999

— The Lesbos-Limnos Civil Credit Cooperative L.L.C. is authorised to establish and operate a credit institution under the name "Cooperative Bank of Lesbos-Limnos L.L.C.".

— The ceilings on mortgage bank financing of: a) natural persons on personal guarantee and b) business firms for working capital are raised, for each of the above categories, from 5 per cent to

15 per cent of the lending bank's total balance of credit outstanding each time.

15 April 1999
Alpha Credit Bank is authorised to acquire 51 per cent of the share capital of the Ionian Bank.

16 April 1999
With a view to further enhancing the anti-inflationary policy pursued, the Bank of Greece decides that the following amounts shall be deposited with it in a non-interest-bearing account for a period of six months:

i) Any amount of the commercial, housing and cooperative banks' total outstanding balance of consumer credit and loans to domestic and import trade which exceeds the corresponding total balance outstanding on 31 March 1999 by:

3.5 per cent or 150 million drachmas on 30 June 1999,
5.5 per cent or 250 million drachmas on 30 September 1999, and
9.5 per cent or 400 million drachmas on 31 December 1999, whichever is the highest in all cases.

ii) Any amount of the banks' total outstanding balance of loans, other than the above, to the private sector and public enterprises and entities which exceeds the corresponding total balance outstanding on 31 March 1999 by:

3.5 per cent or 200 million drachmas on 30 June 1999,
5.5 per cent or 300 million drachmas on 30 September 1999, and
9.5 per cent or 550 million drachmas on 31 December 1999, whichever is the highest in all cases.

18 May 1999
Effective from 19 May 1999, the maximum borrowing of credit institutions from the Bank of Greece through the Lombard facility is adjusted as follows:

a) The additional amount allocated to each credit institution after the allocation of total borrowing is raised from 300 to 700 million drachmas.

b) The additional amount to which a credit institution is entitled if it is a Primary Dealer is raised from 10 billion to 15 billion drachmas.

25 May 1999
The Bank of Piraeus is authorised to expand its branch network by purchasing the five branches of the National Westminster Bank operating in Greece, as the latter bank has ceased to engage in banking in our country.

23 June 1999
With a view to enabling new credit institutions (established from 1 January 1998 onwards) to deal with the special conditions which have emerged in connection with Monetary Policy Council Act 13/16 April 1999 regarding temporary reserve requirements on credit institutions whose credit expansion exceeds the limits set, the Bank of Greece allows the above new credit institutions to calculate in an alternative way the ceiling on the change in their outstanding balance of loans over corresponding balances on 31 March 1999. This ceiling is calculated as a percentage of the paid-up share capital or cooperative or endowment capital of the above credit institutions.

29 June 1999

Credit extended by cooperative banks to their members (natural persons) is henceforth subject to the general provisions applying to the financing of natural persons from credit institutions.

Cooperative banks may register as members, under certain conditions and following a specific (for each cooperative bank) Bank of Greece permission, all kinds of legal persons (excluding credit cooperatives under Law 1667/86) which are located neither in the prefecture in which the cooperative bank engages in business nor in neighbouring prefectures, nor, alternatively, in the administrative region in which the cooperative bank engages in business. For such registration, the cooperative bank needs neither to be located in the same area as the above legal persons nor to submit a feasibility study.

Decisions of the Bank of Greece*

Re: Adequacy of provisions made by credit institutions for claims arising from lending (Bank of Greece Governor's Act 2442/29 January 1999)

The Governor of the Bank of Greece, having regard to:

a) Article 1 of Law 1266/1982 "Authorities responsible for the conduct of monetary, credit and exchange rate policies, and other provisions",

b) Article 18 of Law 2076/1992 "Taking up and pursuit of business of credit institutions, and other relevant provisions",

c) Article 8 of Law 2548/1997 "Provisions relating to the Bank of Greece",

d) Bank of Greece Governor's Act 2438/1998 "Framework of operating principles and assessment criteria for Internal Audit Systems, and specification of responsibilities of credit institutions' organs in the field of Internal Audit",

e) the fact that the adequacy of provisions made by credit institutions for claims arising from lending is so far assessed by the Bank of Greece mainly through on-the-spot inspections (by the Banking Supervision Department) of the quality of credit institutions' lending portfolios,

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* Previous decisions of the Bank of Greece were published in the relevant chapter of the Bank's Report on *Monetary Policy 1998-1999*, March 1999), which was submitted to the Greek Parliament and the Council of Ministers on 31 March 1999.

f) the fact that the aforementioned inspections are conducted periodically, whereas the quality of lending portfolios may change substantially in the period between two successive inspections,

g) the fact that a considerable part of credit institutions' loans is secured by pledge or mortgage, but the estimated value of this collateral is, in several cases, higher than its liquidation value,

h) the advisability of: i) introducing a general framework of minimum quantitative criteria for assessing the adequacy of provisions made by credit institutions against doubtful debts, and ii) informing more often the Bank of Greece on the evolution of these provisions, so that any inadequacy thereof may be taken into account when assessing the capital adequacy of credit institutions, and

i) the fact that the Bank of Greece may adopt, under certain conditions, credit institutions' estimates (included in the reports of the internal audit departments of these institutions in accordance with Bank of Greece Governor's Act 2438/1998, Chapter VIII) on the provisions required to cover doubtful debts,

has decided the following:

1. The provisions made by credit institutions which are incorporated in Greece and to which the provisions of Bank of Greece Governor's Act 2054/1992 are applicable, as well as by branches in Greece of credit institutions incorporated in a non-EU country, shall, for the purpose of assessing the capital adequacy of the above credit institutions, be at least equal to the total amount which is derived from the application of the following ratios to the outstanding balances of the relevant categories of claims arising from lending:

Category	Ratio
a) performing loans, including such loans parts of which are in arrears up to 3 months	1 per cent
b) loans parts of which are in arrears for 3 to 6 months	10 per cent
c) loans parts of which are in arrears for 6 to 12 months	25 per cent
d) loans parts of which are in arrears for 12 months and over	40 per cent
e) non-performing loans (accounts Nos 24 and 25 of the Banks' Uniform Accounting Plan)	40 per cent
f) Doubtful debts (accounts Nos 27 and 28 of the Banks' Uniform Accounting Plan)	50 per cent

If interest continues to be posted on claims under categories c) to e) above, despite the existence of due interest in arrears for 6 to 12 months from the date of its posting, an increment amounting to 70 per cent of the interest posted as of 1 January 1999 shall be added to the amount of provisions which is derived from the application of the corresponding ratios to the outstanding balances of the claims in question.

It is clarified that:

i) claims from lending comprise claims arising from all types of loans and credit, from letters of guarantee classified under off-balance-sheet high-risk items for the purposes provided for in Bank of Greece Governor's Act 2054/1992 (excluding those covered by a credit institution's counterguarantee), from forfeited letters of guarantee and from investment in debt securities issued by business firms.

ii) the outstanding balances to which the above ratios shall apply for the calculation of necessary provisions shall be the total outstanding balances of each claim (i.e. both the past-due and the remaining to maturity part of the claim).

iii) each claim shall be classified under one of the above categories on the basis of the part of the amount owed (principal or interest) which remains for the longest in arrears, and

iv) with regard to current accounts, the interest and the principal in arrears shall be determined by the relevant instructions on the filling in of statements 4 and 5 of Table C1 (Bank of Greece Governor's Act 1313/9 June 1988), which are attached to document 534/23 December 1994 of the Bank of Greece's Banking Supervision Department.

It is also clarified that, for the calculation of necessary provisions, claims arising from forfeited letters of guarantee shall be classified, after 3 months of the date of forfeiture, under one of the categories d) to f) above.

2. Claims arising from lending to business firms with a negative net value on the basis of their most recent balance sheets, and to business firms which have got bankrupt or are in the stage of winding-off, shall be classified under item f), regardless of the length of the time period for which past-due debts to a credit institution are in arrears.

3. In particular,

a) for claims arising from housing loans to natural persons, the minimum required provisions shall be 70 per cent of the amounts derived from the application of the ratios referred to in par. 1 above, provided that these claims are secured by mortgages on urban real estate which can be used for housing purposes. As regards claims arising from rescheduled housing loans, the ratio referred to in paragraph 5b below shall be reduced by 30 per cent.

b) for claims arising from consumer credit, credit cards and personal loans, minimum required provisions shall be calculated on the basis of the ratios referred to in par. 1 above, plus an additional 30 per cent.

4. As regards claims referred to in Bank of Greece Governor's Act 2054/1992, chapter 6, par. 1a, indents (4) and (6), instead of applying the ratios referred to in par. 1 above to the total amount of each specific claim, required provisions may be calculated on the basis of only the uncovered part of the claim.

5. In particular for claims arising from debt rescheduling, the following shall apply:

a) written-off parts of claims (excluding calculated but not posted interest) shall either be debited to provisions for doubtful debts or transferred to the profit and loss account of the financial year within which these amounts were written-off.

b) regarding the rescheduled parts of a loan (past-due or remaining to maturity), a provision equal to 20 per cent of the total amount of such parts shall be made for a period of 12 months of the date at which the servicing of the rescheduled debt is expected to begin. Once this 12-month period has passed, the relevant claim shall be treated, for provision-making purposes, in the same manner as any other claim, taking into account any arrears during the above 12-month period.

The alternative way (referred to in par. 4 above) of calculating required provisions shall also apply to any claim of the credit institution which arises from rescheduled debts.

6. For the calculation of required minimum provisions, each loan granted for repayment of past-due debts to the credit institution granting the loan shall be treated as debt rescheduling in accordance with par. 5b) above. This shall also apply to any letter of guarantee issued by a credit institution to secure a loan granted by another credit institution, provided that the loan is used for repayment of past-due debts to the credit institution which has issued the letter of guarantee.

7. The level of required provisions for claims arising from lending according to the provisions of this Act shall be reviewed at least once every six calendar months, on the basis of outstanding balances at the end of the previous calendar six-month period, starting from the balances outstanding on 30 June 1999.

8. To determine the amount of provisions on the total of the claims referred to in paragraphs 1b to 1f, 2, 3 and 4 above, credit institutions may alternatively use, instead of the ratios mentioned in the present Act, estimates on a possible loss from these claims, which estimates are derived from a detailed assessment report on loans granted by credit institutions; under Bank of Greece Governor's Act 2438/1998 (Chapter VIII), such reports must be drawn up by credit institutions' internal audit departments and submitted to the Administration and the Board of Directors. This alternative can be used on condition that the above report, which is communicated to the Bank of Greece, i) is drawn up once each six-month calendar period (instead of once a year as is provided for in Bank of Greece Governor's Act 2438/98) and ii) the Banking Supervision Department of the Bank of Greece has assessed positively such report, with respect to its methodology and the reliability of its quantitative estimates, which must include the possible loss for each specific claim, at least for claims exceeding 30 million drachmas. It should be noted that credit institutions which choose this alternative shall not be relieved of the obligation to submit the data provided for in par. 9 below.

9. Credit institutions incorporated in Greece and branches in Greece of banks incorporated in non-EU countries shall submit to the Bank of Greece (Banking Supervision Department), according to the attached form, data on claims and provisions for each calendar six-month period, within three months of the end of this period, starting from the calendar six-month period ending on 30 June 1999.

10. It is clarified that the amounts of provisions for claims arising from lending, which are determined by the present Act may be readjusted by the Bank of Greece, on the basis of the findings of

on-the-spot inspections carried out by its Banking Supervision Department, or on the basis of other reliable data which the Bank of Greece gets to know.

* * *

Re: Amendment of Bank of Greece Governor's Act 2185/24 March 1993 on credit institutions' borrowing from the Bank of Greece against collateral of Greek government securities (Monetary Policy Council Act 14/18 May 1999)

The Monetary Policy Council of the Bank of Greece, having regard to:

a) Articles 7 and 12 of Law 2548/97 "Provisions relating to the Bank of Greece",

b) Bank of Greece Governor's Act 2185/24 March 1993, as amended (last relevant Monetary Policy Council Act: 6/31 July 1998),

c) Bank of Greece Governor's Act 2407/26 March 1997 on credit institutions' deposits with the Bank of Greece,

d) the advisability of further adjusting the framework of credit institutions' borrowing from the Bank of Greece to the conditions which have emerged in money and capital markets,

has decided:

to amend the provisions of paragraph 1 of Monetary Policy Council Act 6/31 July 1998 and to raise:

1. from 300 million drachmas to 700 million drachmas per credit institution the amount which is added after the allocation of the total amount of lending to credit institutions (Monetary Policy Council Act 6/31 July 1998, par. 1a);

2. from 10 billion drachmas to 15 billion drachmas the additional amount allocated to each credit institution which has been appointed as a Primary Dealer in the Greek government securities market (Monetary Policy Council Act 6/31 July 1998, par. 1b).

The other provisions of Monetary Policy Council Act 6/31 July 1998 shall remain unchanged.

The provisions of this Act shall be effective as of 19 May 1999.

Statistical section

Tables

Table I.1

Consumer price index

(Percentage change with respect to the corresponding period of the previous year)

Period	General index	General index excluding food and fuels	General index excluding fresh fruit/vegetables and fuels	Goods	Services	Sub-indices		
						Food and non-alcoholic beverages	Fresh fruit and vegetables	Fuels
1995	8.9	9.6	9.4	7.4	11.4	8.4	8.2	2.8
1996	8.2	8.4	8.1	7.2	9.9	7.0	8.4	10.2
1997	5.5	6.8	6.0	3.7	8.4	4.1	11.0	–4.9
1998	4.8	5.7	5.3	3.9	6.2	4.4	7.0	–5.9
1997 I	6.4	7.3	6.7	5.0	8.6	4.4	6.6	2.8
II	5.6	7.3	6.4	3.6	8.8	3.5	8.0	–7.3
III	5.3	6.7	5.8	3.2	8.6	5.1	21.2	–10.0
IV	4.9	5.9	5.3	3.1	7.6	3.5	9.9	–3.9
1998 I	4.4	5.0	4.5	3.4	6.0	4.9	16.8	–4.7
II	5.3	6.0	5.7	4.5	6.5	4.6	5.4	–2.2
III	5.1	6.2	5.9	4.3	6.4	3.8	–0.8	–3.4
IV	4.3	5.5	5.2	3.2	5.8	4.4	6.8	–13.3
1999 I	3.6	4.5	4.4	2.8	4.9	4.3	6.4	–11.9
II	2.4	3.2	2.9	1.3	4.2	1.7	1.7	–6.1
1996 Jan.	8.4	9.0	8.8	6.9	10.7	5.6	–0.9	9.1
Feb.	8.4	9.1	8.8	7.2	10.4	6.0	0.5	8.7
March	8.9	8.7	8.7	8.1	10.0	8.2	9.1	12.4
Apr.	8.8	8.7	8.5	8.0	10.0	7.9	9.1	13.7
May	8.7	8.7	8.5	7.9	10.1	8.5	12.5	9.3
June	8.4	8.4	8.2	7.3	10.1	8.5	13.7	7.4
July	8.1	8.2	7.9	7.4	9.5	7.7	12.5	9.6
Aug.	8.0	8.0	7.7	7.2	9.4	7.7	12.8	9.3
Sept.	7.9	7.8	7.5	7.3	9.1	7.7	15.3	10.5
Oct.	8.0	8.1	7.6	6.8	10.0	5.7	6.3	14.9
Nov.	7.5	7.9	7.4	6.2	9.8	5.6	8.2	9.5
Dec.	7.3	7.8	7.4	6.0	9.5	5.1	4.4	8.2
1997 Jan.	6.8	7.1	6.9	5.6	8.6	6.2	8.4	4.3
Feb.	6.5	7.2	6.6	5.3	8.5	4.9	9.9	3.1
March	6.0	7.4	6.5	4.3	8.8	2.3	2.0	1.0
Apr.	5.9	7.4	6.5	4.1	8.7	2.6	3.0	–1.6
May	5.4	7.6	6.6	3.1	9.2	3.1	5.4	–10.9
June	5.6	7.0	6.1	3.7	8.5	4.9	16.0	–9.0
July	5.4	6.6	5.8	3.5	8.5	5.8	24.4	–9.6
Aug.	5.6	6.8	5.9	3.6	8.7	5.9	28.4	–9.0
Sept.	4.9	6.8	5.8	2.7	8.5	3.6	11.6	–11.5
Oct.	4.7	6.0	5.4	2.9	7.6	4.1	13.6	–8.8
Nov.	5.1	6.0	5.3	3.5	7.7	3.6	9.7	–0.1
Dec.	4.7	5.8	5.1	3.0	7.4	2.9	7.0	–2.2
1998 Jan.	4.4	5.1	4.3	3.4	5.9	4.9	20.8	–4.9
Feb.	4.3	4.9	4.4	3.2	5.9	4.5	14.7	–4.3
March	4.6	5.1	4.7	3.6	6.1	5.2	15.0	–4.8
Apr.	5.3	6.0	5.5	4.5	6.6	5.0	9.9	–1.9
May	5.3	5.9	5.6	4.7	6.2	5.2	7.0	–1.9
June	5.2	6.2	5.9	4.3	6.6	3.6	–0.3	–2.7
July	5.1	6.3	6.1	4.1	6.6	2.8	–7.2	–1.7
Aug.	5.0	6.3	6.0	4.0	6.6	3.3	–3.9	–4.0
Sept.	5.2	6.0	5.7	4.7	6.1	5.2	9.3	–4.5
Oct.	4.7	5.8	5.5	3.9	5.9	4.9	9.3	–10.9
Nov.	4.2	5.6	5.3	3.1	5.9	4.2	5.4	–14.0
Dec.	3.9	5.1	4.9	2.7	5.6	4.0	6.0	–15.0
1999 Jan.	3.7	4.7	4.6	2.7	5.2	4.1	6.0	–12.8
Feb.	3.7	4.6	4.5	2.9	4.9	4.7	7.0	–12.8
March	3.4	4.2	4.0	2.7	4.6	4.1	6.2	–10.0
Apr.	2.8	3.5	3.2	1.8	4.3	2.8	5.9	–6.9
May	2.4	3.3	2.8	1.1	4.3	1.2	2.0	–5.9
June	2.1	2.9	2.7	0.9	4.0	1.0	–2.7	–5.4

Source: Calculations based on NSSG data (CPI 1994=100).

Table I.2

Wholesale price index*

(Percentage change with respect to the corresponding period of the previous year)

Period	General index	Sub-indices			
		Final domestic products for home consumption		Exported products (primary and industrial)	Imported products
		Primary	Industrial		
1995	8.1	7.8	8.2	10.6	6.3
1996	6.1	4.4	8.1	7.2	2.4
1997	3.3	4.2	4.0	2.9	2.1
1998	3.9	7.5	2.8	3.0	5.4
1997 I	2.4	0.2	5.2	0.3	–0.4
II	2.7	–2.5	3.7	3.1	2.2
III	4.5	11.7	4.1	5.2	3.1
IV	3.5	8.8	3.0	3.1	3.5
1998 I	3.5	11.2	2.1	3.1	4.3
II	5.1	3.4	4.1	5.8	7.1
III	3.5	1.7	3.0	2.5	5.4
IV	3.4	14.4	2.2	0.7	5.1
1999 I	2.1	10.0	2.3	–0.9	1.8
1997 Jan.	2.7	0.2	5.7	0.2	–0.5
Feb.	2.5	3.8	5.6	–0.4	–1.0
March	2.1	–3.3	4.2	1.2	0.3
Apr.	2.1	–3.1	3.4	2.1	1.3
May	2.4	–6.1	3.7	2.9	2.3
June	3.6	2.0	4.1	4.3	3.0
July	4.5	13.7	3.9	5.1	3.1
Aug.	4.9	12.5	4.7	6.0	2.9
Sept.	4.0	8.8	3.8	4.5	3.3
Oct.	3.6	5.6	2.9	4.0	3.8
Nov.	3.5	9.4	3.0	2.8	3.5
Dec.	3.5	11.4	3.0	2.6	3.2
1998 Jan.	3.2	14.7	1.7	3.0	3.3
Feb.	2.6	9.1	1.8	1.8	3.2
March	4.5	10.0	2.8	4.6	6.3
Apr.	5.6	5.8	3.9	6.8	7.9
May	5.4	5.5	4.4	5.9	7.1
June	4.3	–1.1	3.9	4.7	6.2
July	3.5	–3.2	3.6	3.0	5.3
Aug.	2.9	–0.6	2.5	1.9	5.1
Sept.	4.0	9.2	3.0	2.6	5.7
Oct.	3.9	16.7	2.5	1.0	5.8
Nov.	3.5	12.5	2.2	1.6	4.8
Dec.	3.0	14.1	1.7	–0.4	4.6
1999 Jan.	2.7	10.8	2.3	–0.7	3.5
Feb.	2.8	12.2	2.4	0.4	2.8
March	1.0	7.0	2.3	–2.3	–0.9
Apr.	0.1	7.0	2.2	–4.4	–2.2
May	0.1	6.3	1.6	–3.7	–1.8

* New, revised, wholesale price index (1990=100).

Source: NSSG.

Table I.3

Industrial production index

(Percentage change with respect to the corresponding period of the previous year)

Period	Industry						
		Manufacturing					
	General index	General	Consumer goods[2]	Consumer durables	Capital goods	Mining and quarrying	Electricity and town gas
1995	1.8	2.1	0.5	–1.5	6.5	–3.2	3.5
1996	1.2	0.6	0.7	2.4	0.1	3.3	3.8
1997	1.1	1.0	–0.6	6.7	4.3	3.6	0.4
1998	7.7	3.4	2.8	24.2	2.0	–4.4	48.0
1997 II	1.3	0.3	–2.4	14.8	4.6	2.9	7.5
III	0.4	0.3	–1.1	15.6	3.1	4.1	–1.9
IV	1.4	2.8	3.2	–2.5	3.3	–9.7	–1.0
1998 I	4.7	3.1	2.5	17.6	2.3	–1.3	19.6
II	7.7	6.2	5.6	13.9	6.0	–2.8	27.4
III	9.3	3.7	3.0	42.9	0.4	–5.6	62.7
IV	8.6	0.8	0.4	24.5	–0.8	–7.9	83.3
1999[1] I	4.6	–0.8	–0.5	20.5	–4.4	–19.0	49.4
1996 July	2.5	0.7	0.3	5.3	2.9	6.8	12.4
Aug.	–1.0	–1.9	–4.0	0.2	3.3	7.3	–0.1
Sept.	4.2	4.1	5.2	5.3	0.7	11.9	–1.0
Oct.	–1.8	–2.7	–4.3	11.8	–1.0	3.8	2.7
Nov.	1.0	0.7	–0.4	5.8	1.3	8.8	–1.9
Dec.	–0.6	–3.3	–4.9	–6.6	0.4	22.5	3.1
1997 Jan.	2.4	1.5	0.9	12.7	1.3	14.5	1.0
Feb.	0.6	–0.9	–3.2	–7.5	5.5	25.5	–4.3
March	1.5	0.5	–3.6	–0.5	11.7	22.1	–3.3
Apr.	3.7	3.2	0.9	0.1	8.9	7.0	4.9
May	–1.6	–2.4	–4.7	19.4	–0.1	–5.4	9.0
June	1.9	0.5	–3.2	24.1	5.3	7.3	8.4
July	0.2	0.2	–1.9	22.1	1.6	7.0	–4.4
Aug.	–1.4	–2.1	–2.8	5.7	2.6	8.3	–3.4
Sept.	2.1	2.4	0.9	14.0	5.0	–2.6	3.0
Oct.	1.1	1.7	3.1	–10.1	0.3	–7.4	3.4
Nov.	–0.5	–0.2	–0.9	–10.4	4.2	–5.8	1.5
Dec.	3.7	7.7	8.2	14.1	5.7	–15.9	–7.2
1998 Jan.	3.3	0.2	–2.2	14.7	2.5	4.9	21.9
Feb.	4.1	3.0	1.9	12.1	4.0	–2.7	15.9
March	6.7	5.9	7.5	25.1	0.5	–5.3	21.1
Apr.	7.0	5.6	5.1	35.0	1.8	–6.7	28.7
May	7.6	5.8	4.3	8.2	8.5	1.5	25.8
June	8.5	7.1	7.3	3.3	7.4	–3.1	27.8
July	11.9	8.4	8.3	35.2	3.7	–3.1	45.9
Aug.	10.6	4.1	4.2	83.5	–5.2	–11.5	72.9
Sept.	5.9	–0.7	–2.6	34.1	1.1	–2.3	72.6
Oct.	7.3	0.8	0.1	37.4	–1.2	9.2	62.2
Nov.	10.1	2.7	2.6	31.2	0.0	–13.0	85.2
Dec.	8.6	–1.4	–1.5	7.9	–1.2	–21.3	102.2
1999[1] Jan.	5.8	–0.1	1.6	0.9	–2.7	–19.2	50.8
Feb.	5.2	–0.9	–0.4	35.7	–6.4	–22.2	55.6
March	3.1	–1.2	–2.7	23.2	–3.8	–15.4	41.5
Apr.	3.4	1.1	0.2	18.7	1.3	–17.9	30.3

1 Provisional data.
2 Including non-durable consumer goods and intermediate products.
Source: NSSG.

Table I.4
Retail sales volume

(Percentage change with respect to the corresponding period of the previous year)

Period	General index	Sub-indices			
		Food	Clothing and footwear	Furniture and fixtures	Other goods
1995	–1.6	–1.4	–4.6	–5.9	3.3
1996	1.6	–1.4	–4.4	9.5	4.5
1997	4.3	2.7	–0.1	8.4	6.4
1998	2.4	2.7	1.9	–0.6	3.3
1997 II	4.8	3.6	0.4	11.9	6.2
III	6.9	3.8	7.1	8.5	8.0
IV	3.2	4.9	–5.4	4.3	6.1
1998 I	2.1	2.0	–1.3	5.2	2.0
II	1.9	3.4	2.1	–0.6	0.3
III	1.5	2.9	–1.0	1.2	1.6
IV	3.9	2.5	6.9	–6.1	8.4
1999 I	4.2	3.0	3.9	–2.7	9.6
1996 July	3.9	–5.4	2.2	21.4	4.5
Aug.	1.3	0.1	–1.4	12.4	–1.1
Sept.	–0.4	–10.4	–7.6	2.4	10.6
Oct.	4.6	–1.1	3.3	9.4	8.5
Nov.	–0.5	–0.6	–6.8	4.8	1.8
Dec.	–2.5	–5.8	–6.3	5.2	0.8
1997 Jan.	4.9	–3.4	5.3	11.7	9.4
Feb.	0.8	–3.1	–6.8	11.2	5.4
March	1.4	1.4	–2.9	8.1	1.7
Apr.	4.3	6.2	0.8	8.4	4.1
May	6.3	4.5	2.7	13.4	7.3
June	3.9	–0.3	–2.6	13.9	7.4
July	8.0	3.9	5.8	9.6	11.7
Aug.	4.5	1.3	5.0	6.0	6.2
Sept.	7.9	5.9	12.0	9.7	6.1
Oct.	1.8	3.8	–9.5	1.7	6.7
Nov.	1.3	1.8	–3.3	2.1	2.6
Dec.	5.7	8.3	–3.9	7.9	8.2
1998 Jan.	2.9	6.9	–0.5	4.7	0.7
Feb.	2.9	2.5	0.4	2.2	4.3
March	0.1	–3.1	–5.0	9.2	1.1
Apr.	2.3	2.1	3.7	1.4	0.4
May	–2.7	1.9	–8.3	–4.7	–2.9
June	6.3	6.5	12.0	1.5	3.4
July	3.2	3.8	1.0	4.2	1.5
Aug.	1.2	2.0	–0.4	3.0	–0.3
Sept.	0.0	2.9	–4.8	–3.9	3.2
Oct.	2.3	4.1	9.2	–6.8	2.3
Nov.	2.6	–0.6	2.3	–3.1	8.8
Dec.	5.9	3.7	8.4	–7.7	13.0
1999 Jan.	3.4	–0.1	3.0	–3.1	10.2
Feb.	2.6	1.4	2.1	–3.1	6.9
March	6.8	8.0	8.2	–1.8	11.6
Apr.	4.3	3.9	–4.6	3.4	11.2

Source: The NSSG index of retail sales value has been deflated (for each category of goods) using the corresponding sub-indices for prices of goods included in the NSSG consumer price index. Revised data as from January 1996 (CPI 1994=100).

Table I.5
Gross domestic product
(At market prices and at factor cost)

		Billion drachmas	Annual percentage change (at constant prices of the previous year)										
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1.1	Primary sector (agriculture)	1,034.5	3.9	–13.4	14.9	0.0	–0.3	5.9	4.2	–8.0	1.7	1.0	. . .
1.2	Secondary sector	2,264.5	1.8	–0.9	3.0	–2.6	–1.4	–0.9	0.3	4.0	3.4	5.8	. . .
1.2.a	Mining and quarrying	89.3	–3.4	–4.9	–3.3	0.4	1.2	0.2	–1.1	5.3	3.1	–4.0	. . .
1.2.b	Manufacturing	1,308.7	1.7	–2.0	3.7	–3.5	–3.1	2.0	0.1	3.6	0.1	3.0	. . .
1.2.c	Electricity - town gas - water supply	214.1	9.2	2.5	3.3	8.1	–3.8	9.6	3.1	6.0	2.3	12.0	. . .
1.2.d	Construction	652.4	0.4	0.8	2.3	–4.4	2.7	–9.1	–0.2	4.0	10.3	10.0	. . .
1.3.	Tertiary sector	5,243.5	3.8	1.6	0.4	2.4	–2.7	4.3	3.1	2.8	3.3	3.6	. . .
1.3.a	Transportation - communications	556.8	2.2	–2.7	0.6	11.4	3.2	–0.7	7.6	1.7	10.1	6.0	. . .
1.3.b	Trade	1,261.8	4.6	1.7	0.4	7.6	–0.4	3.0	2.8	5.3	3.2	1.5	. . .
1.3.c	Insurance - banking	295.8	–7.5	–0.9	14.8	9.6	26.4	12.8	6.1	4.9	8.7	8.0	. . .
1.3.d	Ownership of dwellings	979.3	3.0	2.6	3.0	–4.4	–2.9	2.1	1.2	1.6	1.0	1.2	. . .
1.3.e	Public administration - defence	596.2	3.2	1.1	–6.7	–4.7	–0.7	0.6	8.6	7.4	–7.6	–2.0	. . .
1.3.f	Health - education	682.7	10.8	5.7	0.6	0.2	–2.9	11.6	–0.2	–5.9	2.2	1.5	. . .
1.3.g	Miscellaneous services	870.9	3.4	0.3	–1.9	3.6	0.3	4.8	2.1	5.2	7.7	10.0	. . .
1.4	Statistical discrepancies	–224.2	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
1.5	GDP at factor cost	8,318.3	3.1	–0.9	2.6	0.8	–1.7	2.8	2.2	1.9	3.0	3.7	. . .
2.1	Private consumption	6,502.0	6.0	2.6	2.8	2.4	–0.8	2.0	2.7	1.9	2.5	1.8	2.3
2.2	Public consumption	1,311.0	5.4	0.6	–1.5	–3.0	2.6	–1.1	5.6	1.0	–0.4	0.4	–1.3
2.3	Gross fixed capital formation	1,966.7	7.1	5.0	4.8	–3.2	–3.5	–2.8	4.2	8.8	9.6	9.8	9.0
2.3.a.a	By type: Construction	1,326.0	2.0	3.2	3.2	–8.3	–6.0	–4.3	1.7	7.1	9.8	10.2	8.1
2.3.a b	Equipment	640.7	17.4	8.4	7.9	6.7	0.6	–0.3	8.4	11.5	9.3	9.1	10.4
2.3.b.a	By investor: Private	1,542.6	7.0	8.7	2.0	–6.3	–5.0	–2.1	2.0	9.9	10.5	8.4	7.7
2.3.b.b	Public	424.0	7.2	–8.3	16.9	8.2	1.1	–4.7	10.9	5.9	7.0	13.7	12.4
2.4	Change in stocks and statistical discrepancies (as a percentage of GDP)	53.5	–0.3	–0.2	0.9	–0.3	–0.3	0.1	0.7	0.1	0.0	0.3	0.4
2.5	Domestic final demand	9,833.2	5.3	2.9	3.7	–0.6	–0.9	1.2	3.9	2.9	3.4	3.3	3.2
2.6	Exports of goods and services	1,696.4	4.8	–4.1	3.7	10.5	–3.2	6.6	0.5	3.0	5.3	9.2	4.9
2.6.a	Exports of goods	1,111.6	11.1	–7.2	5.8	11.6	–6.9	4.6	3.7	4.1	5.1	5.0	4.5
2.7	Imports of goods and services	2,360.6	10.6	8.7	6.0	1.4	0.2	1.3	9.2	4.9	5.4	5.7	4.6
2.7.a	Imports of goods	2,157.9	10.9	9.0	6.8	1.7	0.2	0.7	9.9	5.8	5.4	4.8	4.5
2.8	Balance of trade in goods and services	–664.2	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
2.9	GDP at market prices	9,169.0	3.8	0.0	3.1	0.7	–1.6	2.0	2.1	2.4	3.2	3.7	3.2

Source: 1988-95: NSSG/National Accounts (September 1998). Final data on the basis of the European System of Integrated Economic Accounts (ESA).
1996 - 97: NSSG/National Accounts (September 1998). Provisional estimates.
1998: Ministry of National Economy/Directorate of Macroeconomic Analysis (March-June 1999). Estimates and forecasts.

Table II.1

Balance of payments

(Million ECU/euro)

		January			Percentage change	
		1997	1998	1999	1998	1999
I	***CURRENT ACCOUNT BALANCE (I.A+I.B+I.C+I.D)***	***15.9***	***187.6***	***–501.1***		
I.A	**TRADE BALANCE (I.A.1– I.A.2)**	**–1,236.9**	**–1,287.5**	**–1,147.5**		
	Non-oil TRADE BALANCE	–205.4	–193.4	–96.2		
	Oil TRADE BALANCE	–1,031.5	–1,094.1	–1,051.3		
I.A.1	**Exports of goods**	**439.9**	**391.3**	**608.7**	**–11.0**	**55.6**
	Oil	34.5	16.2	46.4		
	Other	405.4	375.1	562.3		
I.A.2	**Imports of goods**	**1,676.8**	**1,678.8**	**1,756.2**	**0.1**	**4.6**
	Oil	239.9	209.6	142.6		
	Other	1,436.9	1,469.2	1,613.6		
I.B	**SERVICES BALANCE (I.B.1– I.B.2)**	**375.5**	**376.6**	**286.5**		
I.B.1	**Receipts**	**650.0**	**643.5**	**618.2**	**–1.0**	**–3.9**
	Travel	262.8	260.8	259.5		
	Transportation	145.7	134.1	125.8		
	Other	241.4	248.5	232.9		
I.B.2	**Payments**	**274.5**	**266.8**	**331.8**	**–2.8**	**24.3**
	Travel	91.5	98.9	160.3		
	Transportation	24.4	22.3	40.6		
	Other	158.6	145.6	130.9		
I.C	**INCOME ACCOUNT (I.C.1– I.C.2)**	**–97.8**	**–82.9**	**–3.9**		
I.C.1	**Receipts**	**96.9**	**87.4**	**160.2**	**–9.8**	**83.2**
	Compensation of employees	11.0	20.9	38.4		
	Interest, dividends, profits	85.9	66.6	121.8		
I.C.2	**Payments**	**194.7**	**170.3**	**164.0**	**–12.5**	**–3.7**
	Compensation of employees	17.3	40.8	13.4		
	Interest, dividends, profits	177.5	129.6	150.6		
I.D	**TRANSFERS ACCOUNT (I.D.1– I.D.2)**	**975.2**	**1,181.3**	**363.7**		
I.D.1	**Receipts**	**977.7**	**1,183.5**	**383.9**	**21.0**	**–67.6**
	General government (EU transfers)	775.9	974.6	247.2		
	Other (emigrants' remittances, etc)	201.8	208.9	136.7		
I.D.2	**Payments**	**2.6**	**2.2**	**20.2**	**–12.8**	**806.7**
	General government	0.3	0.1	14.1		
	Other	2.3	2.1	6.2		
II	***FINANCIAL ACCOUNT (II.A+II.B+II.C+II.D)***	***23.1***	***–337.4***	***673.6***		
II.A	**DIRECT INVESTMENT***	**71.0**	**63.6**	**96.0**		
II.B	**PORTFOLIO INVESTMENT***	**338.3**	**1.7**	**3,722.4**		
II.C	**OTHER***	**683.3**	**120.3**	**–194.4**		
	Assets	802.4	–73.1	–1,151.5		
	Liabilities	–119.1	193.4	957.2		
	(General government borrowing)	–125.6	191.7	1,685.0		
II.D	**CHANGE IN FOREIGN EXCHANGE RESERVES****	**–1,069.6**	**–523.0**	**–2,950.4**		
III	***ERRORS AND OMISSIONS (I + II)***	***–39.0***	***149.8***	***–172.4***		
	FOREIGN EXCHANGE RESERVES *(end-of-period stock)*	***17,293.8***	***12,858.1***	***21,454.1***		

1 In ECU for 1997 and 1998 and in euro for 1999.

* (+) net inflow, (–) net outflow.

** (+) decrease, (–) increase.

Source: Bank of Greece.

Table II.2
Drachma exchange rate

Period	Nominal exchange rate index[1]	Exchange rate of the drachma against the ECU		Exchange rate of the drachma against the USD		Exchange rate of the drachma against the DEM	
	Percentage change on previous period	Drachmas per ECU	Percentage change on previous period	Drachmas per USD	Percentage change on previous period	Drachmas per DEM	Percentage change on previous period
1991	–11.2	225.182	–10.5	182.265	–13.0	109.850	–10.6
1992	–8.3	246.593	–8.7	190.707	–4.4	122.276	–10.2
1993	–9.2	267.989	–8.0	229.250	–16.8	138.645	–11.8
1994	–7.1	287.183	–6.7	242.603	–5.5	149.629	–7.3
1995	–3.5	299.538	–4.1	231.663	4.7	161.747	–7.5
1996	–1.1	301.477	–0.6	240.712	–3.8	160.041	1.1
1997	–1.9	308.425	–2.3	273.058	–11.8	157.498	1.6
1998	–5.9	331.498	–7.0	295.529	–7.6	168.022	–6.3
1996 I	–0.9	303.318	–0.1	241.495	–2.8	164.424	0.3
II	1.6	299.581	1.2	242.175	–0.3	159.211	3.3
III	0.5	300.180	–0.2	237.986	1.8	158.944	0.2
IV	–0.1	302.830	–0.9	241.191	–1.3	157.586	0.9
1997 I	–1.0	304.706	–0.6	260.288	–7.3	156.968	0.4
II	–1.9	309.609	–1.6	271.770	–4.2	158.684	–1.1
III	–0.5	309.039	0.2	284.014	–4.3	157.109	1.0
IV	0.8	310.347	–0.4	276.160	2.8	157.233	–0.1
1998 I	–2.8	319.043	–2.7	293.388	–5.9	161.296	–2.5
II	–5.9	340.598	–6.3	309.306	–5.1	172.366	–6.4
III	2.7	333.166	2.2	297.824	3.9	168.988	2.0
IV	–0.1	333.186	0.0	281.599	5.8	169.438	–0.3
1997 Jan.	0.2	304.131	0.3	251.549	–2.5	156.657	0.9
Feb.	–0.3	304.253	0.0	262.453	–4.2	156.731	0.0
March	–0.5	305.735	–0.5	266.862	–1.7	157.515	–0.5
Apr.	–0.6	308.343	–0.8	270.151	–1.2	158.063	–0.3
May	–1.2	310.810	–0.8	271.459	–0.5	159.481	–0.9
June	–0.1	309.673	0.4	273.679	–0.8	158.507	0.6
July	0.0	309.417	0.1	280.976	–2.6	156.898	1.0
Aug.	–0.1	308.374	0.3	288.890	–2.7	156.730	0.1
Sept.	0.2	309.327	–0.3	282.176	2.4	157.699	–0.6
Oct.	0.5	309.323	0.0	276.870	1.9	157.424	0.2
Nov.	0.6	310.482	–0.4	271.994	1.8	156.951	0.3
Dec.	–0.4	311.235	–0.2	279.615	–2.7	157.325	–0.2
1998 Jan.	–0.7	312.184	–0.3	286.992	–2.6	158.078	–0.5
Feb.	–0.2	312.267	0.0	286.807	0.1	158.154	0.0
March	–5.5	332.678	–6.1	306.365	–6.4	167.657	–5.7
Apr.	–3.9	345.843	–3.8	316.853	–3.3	174.436	–3.9
May	1.7	340.676	1.5	306.931	3.2	172.971	0.8
June	2.0	335.276	1.6	304.133	0.9	169.690	1.9
July	1.9	329.146	1.9	299.429	1.6	166.561	1.9
Aug.	–0.6	331.970	–0.9	300.994	–0.5	168.324	–1.0
Sept.	–1.8	338.382	–1.9	293.049	2.7	172.080	–2.2
Oct.	0.1	339.159	–0.2	281.738	4.0	172.123	0.0
Nov.	1.8	330.675	2.6	282.694	–0.3	168.190	2.3
Dec.	0.1	329.723	0.3	280.365	0.8	168.003	0.1
1999 Jan.	1.1	323.579	1.9	278.776	0.6	165.443	1.5
Feb.	0.0	321.989	0.5	286.855	–2.8	164.631	0.5
March	–0.6	322.423	–0.1	296.180	–3.1	164.852	–0.1
Apr.	–1.4	325.725	–1.0	304.362	–2.7	166.540	–1.0
May	0.1	325.253	0.1	305.626	–0.4	166.299	0.1

1 The index is weighted on the basis of non-oil trade flows and includes the currencies of 15 competitor countries.
Source: Bank of Greece.

Table II.3
External public debt servicing
(Million US dollars)

	Year		
	1996	1997	1998
INTEREST	2,516.6	2,087.8	2,227.8
a) Central government	419.8	338.9	380.2
b) Public enterprises	266.3	191.6	177.4
c) Bank of Greece	1,830.5	1,557.3	1,670.2
AMORTISATION	6,196.0	6,566.1	6,724.2
a) Central government	3,236.0	2,666.3	3,479.3
b) Public enterprises	707.5	1,286.2	1,118.5
c) Bank of Greece	2,193.8	2,569.9	2,081.5
d) Other banks	58.7	43.7	44.9
TOTAL	8,712.6	8,653.9	8,953.2

Source: Bank of Greece.

Table III.1

Monetary aggregates and liquid assets[1]

(End-of-period outstanding balances in billion drachmas)

Period	Currency in circulation	Deposits by residents (in drachmas)	Deposits by residents (in foreign currency)	Repos	Bank bonds	Money market fund units	Greek government securities with an initial maturity of up to one year	Liquidity indicator M4N
1994	1,687.7	12,892.1	707.1	129.2	837.6	397.6	5,335.8	21,987.1
1995	1,863.6	14,736.7	888.5	56.0	539.8	1,258.4	5,509.2	24,852.2
1996	1,941.4	16,625.3	1,041.9	60.5	50.0	2,299.1	6,631.1	28,649.3
1997	2,182.7	18,322.6	1,383.7	36.7	106.5	4,450.7	4,400.1	30,883.0
1998*	2,229.3	18,668.3	2,642.8	894.9	137.1	5,986.5	3,339.8	33,898.7
1997 Jan.	1,787.4	16,754.3	1,053.8	131.1	86.2	2,537.4	5,735.8	28,086.0
Feb.	1,753.8	16,702.2	1,018.2	88.2	98.7	2,692.8	5,208.5	27,562.4
March	1,712.9	16,792.1	1,029.2	70.9	98.8	2,837.4	5,283.6	27,824.9
Apr.	1,916.2	16,998.0	1,041.9	67.5	95.2	2,877.1	5,427.3	28,423.2
May	1,885.7	17,023.0	1,034.9	89.4	99.6	2,968.4	5,176.9	28,277.9
June	1,899.5	17,633.9	1,064.7	92.9	104.1	3,169.2	5,086.1	29,050.4
July	2,011.9	17,453.4	1,102.3	63.3	107.7	3,399.7	4,812.1	28,950.4
Aug.	1,972.4	17,529.8	1,614.8	15.7	107.9	3,531.6	4,846.2	29,618.4
Sept.	1,902.2	17,919.6	1,127.9	40.1	107.5	3,790.1	4,352.0	29,240.4
Oct.	1,934.9	17,904.0	1,272.1	24.4	103.2	3,523.4	4,203.5	28,965.5
Nov.	1,865.6	17,320.9	1,357.1	28.8	116.8	4,080.7	4,405.6	29,175.5
Dec.	2,182.7	18,322.6	1,383.7	36.7	106.5	4,450.7	4,400.1	30,883.0
1998 Jan.	1,947.9	17,346.3	1,355.8	67.5	99.7	4,977.3	4,356.0	30,150.5
Feb.	1,914.4	17,253.2	1,531.5	40.8	95.8	5,383.4	4,207.4	30,426.5
March	1,851.3	17,535.6	1,808.3	82.6	104.7	5,417.2	4,224.6	31,024.3
Apr.	2,007.8	17,524.7	2,488.1	66.3	87.5	4,986,4	4,240.5	31,401.3
May	2,015.9	17,469.5	2,347.7	98.5	107.3	5,014.4	4,393.0	31,446.3
June	2,030.9	18,088.7	2,395.3	87.3	116.7	5,143.8	4,192.4	32,055.1
July	2.184.6	17.801.8	2,074.4	100.6	124.1	5,506.2	4,209.0	32,000.7
Aug.	2,061.4	17,838.5	2,633.5	92.8	122.4	5,782.9	4,164.7	32,696.2
Sept.	1,978.2	17,709.6	2,298.9	220.2	137.3	5,939.8	3,788.6	32,072.6
Oct.	1,984.9	17,443.5	2,535.0	700.8	141.7	5,619.8	3,869.1	32,294.8
Nov.	1,902.6	17,120.1	2,443.6	838.7	130.6	5,898.2	3,540.5	31,874.3
Dec.*	2,229.3	18,668.3	2,642.8	894.9	137.1	5,986.5	3,339.8	33,898.7
1999 Jan.*	1,986.9	18,433.0	2,571.1	1,203.1	120.3	6,071.7	3,365.0	33,732.0
Feb.*	1,941.4	18,572.6	2,149.7	1,385.2	106.8	6,037.6	3,240.8	33,434.2
March*	2,010.0	19,062.7	2,497.2	1,449.2	75.4	5,845.2	2,919.1	33,858.8
Apr.*	2,170.3	19,430.8	2,438.3	1,490.7	80.1	5,785.6	2,602.0	33,997.7
May*	2,122.8	19,354.8	2,630.2	1,581.4	95.7	5,784.9	2,689.5	34,259.2

1 Monetary aggregates comprise monetary liabilities of banks and money market funds, i.e. Monetary Financial Institutions (MFIs), vis-à-vis the domestic private sector.

* Provisional data.

Source: Bank of Greece.

Table III.2
Interest rates and inflation

End of period	Sight deposit rate	Savings deposit rate	12-month time deposit rate	Bank lending rate[1]				10-year government bond yield	Consumer price index
				Short-term		Long-term			
				To enterprises	To households[2]	To enterprises	To households[3]		
1994	5.1	15.1	17.1	26.4		25.4		–	10.6
1995	5.1	12.8	14.5	21.1		19.5		–	7.9
1996	6.2	10.7	11.9	20.2		18.7		–	7.3
1997	5.9	9.5	11.2	19.1		17.5		10.7	4.7
1998	4.1	8.6	10.0	17.6		16.0		6.9	3.9
1997 Jan.	6.1	10.2	11.3	19.9		17.5		–	6.8
Feb.	5.8	9.7	10.3	19.6		17.9		–	6.5
March	5.5	9.5	10.1	19.3		17.2		–	6.0
Apr.	5.1	9.1	9.7	19.0		17.7		–	5.9
May	4.8	9.0	9.6	18.7		16.4		–	5.4
June	4.9	8.9	9.6	18.3		16.0		9.2	5.6
July	5.1	8.9	9.6	18.2		16.3		9.5	5.4
Aug.	5.1	8.9	9.6	18.2		16.3		9.6	5.6
Sept.	5.0	8.9	9.5	18.4		16.3		9.2	4.9
Oct.	5.0	8.7	9.5	18.2		16.0		11.4	4.7
Nov.	5.6	9.5	11.3	20.1		16.3		10.3	5.2
Dec.	5.9	9.5	11.2	19.1		17.5		10.7	4.7
1998 Jan.	5.8	9.5	11.2	19.5		16.9		11.2	4.4
Feb.	5.6	9.5	11.3	19.8		17.1		10.6	4.3
March	5.8	9.1	11.0	19.3		16.7		8.2	4.6
Apr.	5.3	8.8	10.5	18.7		16.7		7.9	5.3
May	5.1	8.8	10.5	18.5		16.5		7.8	5.3
June	5.2	8.8	10.7	18.6		16.6		7.8	5.2
July	5.1	8.8	10.7	18.3		17.0		7.6	5.1
Aug.	5.2	8.8	10.7	18.2		16.7		8.4	5.0
Sept.	5.3	8.8	10.8	18.2		16.9		8.3	5.2
Oct.	5.2	8.9	10.6	18.0		16.6		7.9	4.7
Nov.	4.7	8.8	10.4	18.0		16.0		7.5	4.2
Dec.	4.1	8.6	10.0	17.6		16.0		6.9	3.9
1999 Jan.	3.7	8.3	9.5	15.6	20.4	14.4	13.6	6.0	3.7
Feb.	3.4	8.1	9.2	14.7	20.5	13.7	13.0	6.0	3.7
March	3.6	8.0	9.2	14.7	20.6	13.7	12.8	6.0	3.4
Apr.	3.4*	8.0*	8.9*	14.9	20.5	13.6	12.7	5.8	2.8
May	3.3*	8.0*	8.5*	14.8*	20.6*	13.7*	12.4*	5.9	2.4
June	3.4*	8.0*	8.4*	14.8*	20.6*	13.7*	12.4*	6.1	2.1

1 Monthly average. Up to December 1998, the average interest rate concerned all types of short- or long-term lending.
2 Average interest rate of all types of consumer loans.
3 Average rate of floating-rate housing loans maturing in over 5 years.
* Provisional data.
Source: Bank of Greece and NSSG.

Table III.3
Interbank market and Bank of Greece interest rates

End of period	Interbank market rates					Bank of Greece rates		
	Overnight	1-month Athibor	3-month Athibor	6-month Athibor	12-month Athibor	Overnight deposit facility (first tranche)	14-day deposit rate	Lombard rate
1994	17.5	18.0	18.2	18.2	–	–	–	24.0
1995	14.1	15.1	15.4	15.7	–	–	–	21.5
1996	12.6	12.7	12.6	12.5	12.5	–	–	21.0
1997	10.8	14.7	15.1	15.2	15.1	10.9	12.75	19.0
1998	10.8	12.0	11.9	11.5	10.8	11.6	12.25	15.5
1997 Jan.	12.4	12.2	11.9	11.7	11.6	–	–	21.0
Feb. . . .	11.9	12.0	11.8	11.6	11.4	–	11.89	20.0
March . . .	10.4	10.9	10.9	10.9	10.9	11.9	11.87	20.0
Apr.	10.5	10.4	10.5	10.6	10.6	11.9	11.90	20.0
May	10.9	11.3	11.2	10.8	10.7	11.9	11.90	19.0
June	11.0	11.5	11.5	11.3	11.1	11.9	11.90	19.0
July	11.5	11.5	11.1	11.0	11.0	11.6	11.90	19.0
Aug. . . .	11.4	11.3	11.2	11.1	11.0	11.3	–	19.0
Sept. . . .	11.3	11.2	11.1	11.0	11.0	11.3	–	19.0
Oct. . . .	13.7	44.5	41.6	27.0	24.3	150.0[1]	–	19.0
Nov. . . .	11.1	14.5	14.5	14.4	14.3	10.9	14.00	19.0
Dec. . . .	10.8	14.7	15.1	15.2	15.1	10.9	12.75	19.0
1998 Jan.	11.7	17.7	18.4	18.0	17.3	10.9	19.00	23.0
Feb. . . .	12.8	17.0	17.6	17.5	17.1	10.9	17.00	23.0
March . . .	10.3	12.6	12.5	12.3	12.1	10.9	15.50	19.0
Apr.	13.8	13.4	13.2	12.7	12.3	11.5	14.25	19.0
May	11.6	13.3	13.2	12.9	12.3	11.5	14.00	19.0
June	11.2	13.6	13.4	13.0	12.3	11.5	13.75	19.0
July	11.9	12.9	12.8	12.6	12.1	11.9	13.00	19.0
Aug. . . .	12.3	16.7	16.2	15.1	14.0	11.9	13.00	16.0
Sept. . . .	11.9	13.2	13.2	13.2	12.8	11.9	13.00	16.0
Oct. . . .	12.0	12.4	12.2	12.1	11.6	11.9	12.75	16.0
Nov. . . .	12.3	12.3	12.0	11.6	11.1	11.9	12.75	16.0
Dec. . . .	10.8	12.0	11.9	11.5	10.8	11.6	12.25	15.5
1999 Jan.	10.9	11.5	11.4	11.1	10.6	11.5	12.00	13.5
Feb. . . .	10.1	10.3	10.3	10.2	9.9	11.5	12.00	13.5
March . . .	10.2	10.4	10.2	10.0	9.5	11.5	12.00	13.5
Apr.	10.2	10.1	10.0	9.7	9.3	11.5	12.00	13.5
May	10.8	10.3	10.2	9.8	9.2	11.5	12.00	13.5
June	10.3	10.1	10.1	9.7	9.0	11.5	12.00	13.5

1 3-day tender rate.
Source: Bank of Greece.

Table III.4
Interest rates on Greek government paper at date of issue

End of period*	Treasury bills			Floating-rate drachma bonds[1]		Fixed-rate drachma bonds		
				7-year		2-year	2-year	3-year
	3-month	6-month	12-month	Coupon rate	Average tender rate	Zero-coupon	Savings bonds	Privatisation certificates[2]
1994 Dec. . . .	15.75	16.5	17.5	19.5				
1995 Dec. . . .	–	–	14.2	–				
1996 Dec. . . .	10.2	10.5	11.2	12.6	12.42			
1997 Dec. . . .	12.9	12.7	11.4	–	–			
1998 Dec. . . .	11.1	10.5	10.3	–	–	–	10.0	–
1997 Jan.	9.8[3]	10.1[3]	10.9	12.4	12.29	10.3		
Feb.	9.4[3]	9.7[3]	10.5	–	–	10.1		
March . .	9.2[3]	9.5[3]	10.3	–	–	10.1		
Apr.	9.2[3]	9.5[3]	10.3[3]	–	–	9.9		
May	8.5[3]	8.8[3]	9.6	–	–	–		
June . . .	–	–	9.6	10.4	10.39	9.5		
July	–	–	9.6	10.4	10.49	–		
Aug. . . .	8.4[3]	8.7[3]	9.5	10.3	10.45	–		
Sept. . . .	–	–	9.5	10.3	10.49	9.4		
Oct. . . .	–	–	11.3	10.3	10.54	–		
Nov. . . .	12.8	–	11.2	–	–	–		
Dec. . . .	12.9	12.7	11.4	–	–	–		
1998 Jan.	13.9	13.8	12.4	–	–	–		
Feb.	13.1	–	12.7	–	–	–		
March . .	12.8	–	10.8	–	–	–		
Apr.	10.7	11.3	11.1	–	–	–		
May	10.8	11.3	11.3	–	–	–		
June . . .	11.8	11.9	11.7	–	–	–		
July	11.5	11.7	11.5	–	–	–		
Aug. . . .	–	11.5	13.2	–	–	–	10.75	
Sept. . . .	–	12.3	11.6	–	–	–	–	
Oct. . . .	12.6	12.6	11.0	–	–	–	10.75	9.4
Nov. . . .	–	–	10.5	–	–	–	10.3	–
Dec. . . .	11.1	10.5	10.3	–	–	–	10.0	–
1999 Jan.	–	–	9.5	–	–	–	9.2	–
Feb.	9.5	9.5	9.2	–	–	–	9.0	–
March . .	8.9	8.7	8.8	–	–	–	8.6	–
Apr.	–	–	8.7	–	–	–	8.6	–
May	–	–	8.7	–	–	–	8.6	–
June . . .	9.4	9.0	8.7	–	–	–	8.6	–

1 The interest rate is determined yearly and is equal to the twelve-month Treasury bill rate, plus a spread which varies according to the initial maturity of the bond.
2 Tax-free bonds convertible into shares.
3 Renewal rate.
(–): No issue.
* Rate of last issue in the respective month or at the beginning of the following month.
Source: Bank of Greece.

Table III.4 *(continued)*
Interest rates on Greek government paper at date of issue

End of period	Fixed-rate drachma bonds									
	3-year		5-year		7-year		10-year		15-year	
	Coupon rate	Average tender rate	Coupon rate	Average tender rate	Coupon rate	Average tender rate	Coupon rate	Average tender rate	Coupon rate	Average tender rate
1996 Dec. . . .	10.7	10.48								
1997 Dec. . . .	–	–	–	–	–	–	–	–	–	–
1998 Dec. . . .	–	–	–	–	8.7[1]	8.25	8.6[1]	7.19	–	–
1997 Jan.	10.2	10.24								
Feb.	–	–								
March . .	9.8	10.1	9.2	9.6	8.9	9.1				
Apr.	–	–	–	–	–	–				
May	–	–	–	–	–	–				
June . . .	9.8[1]	9.6	9.2[1]	9.2	8.9[1]	9.0	8.8	8.9		
July	–	–	9.2[1]	9.6	8.9[1]	9.5	8.8[1]	9.28		
Aug. . . .	–	–	–	–	–	–	–	–		
Sept. . . .	–	–	9.2[1]	9.74	8.9[1]	9.66	8.8[1]	9.09		
Oct. . . .	9.8[1]	10.01	9.2[1]	10.0	8.9[1]	9.7	8.8[1]	9.17		
Nov. . . .	–	–	–	–	–	–	–	–		
Dec. . . .	–	–	–	–	–	–	–	–		
1998 Jan.	–	–	–	–	–	–	–	–		
Feb.	–	–	–	–	–	–	–	–		
March . .	–	–	8.9	8.6	–	–	8.6	7.9		
Apr.	–	–	–	–	8.7	8.64	–	–		
May	9.7	9.65	–	–	–	–	8.6[1]	7.8	7.5	7.7
June . . .	9.7[1]	10.03	8.9[1]	8.99	8.7[1]	8.4	–	–	–	–
July	–	–	–	–	–	–	8.6[1]	7.85	7.5[1]	7.4
Aug. . . .	9.7[1]	9.89	–	–	8.7[1]	7.8	–	–	–	–
Sept. . . .	–	–	–	–	–	–	8.6[1]	8.26	–	–
Oct. . . .	–	–	–	–	–	–	–	–	–	–
Nov. . . .	9.3	9.36	8.9[1]	8.76	–	–	8.6[1]	7.81	7.5[1]	7.29
Dec. . . .	–	–	–	–	8.7[1]	8.25	8.6[1]	7.19	–	–
1999 Jan.	7.6	7.56	6.6	6.75	–	–	6.3	6.1	6.5	6.32
Feb.	–	–	–	–	6.0	5.94	–	–	–	–
March . .	7.6[1]	7.10	–	–	–	–	6.3[1]	5.98	6.5[1]	6.27
Apr.	–	–	6.6[1]	6.31	6.0[1]	6.07	–	–	–	–
May	7.6[1]	6.53	–	–	–	–	6.3[1]	5.66	6.5[1]	5.9
June . . .	–	–	6.6[1]	6.12	–	–	–	–	6.5[1]	6.53

1 Re-opening of the last issue with corresponding maturity.
(-): No issue.
Source: Bank of Greece.

Table III.5
Total bank credit to the private sector

(End-of-period outstanding balances in billion drachmas)

Period	Total	In drachmas	In foreign currency	Branches of economic activity					
				Manufacturing	Trade	Housing	Tourism	Consumer credit	Other
1995 Dec.	8,328.0	6,858.1	1,469.9	2,788.9	1,584.8	1,219.0	398.5	423.1	1,913.7
1996 Dec.	9,676.1	7,362.2	2,313.9	3,028.9	1,890.4	1,554.4	439.1	574.5	2,188.8
1997 Dec.	11,145.8	8,407.5	2,738.3	3,185.4	2,316.9	1,924.4	464.7	731.6	2,522.8
1998 Dec.	12,817.7	9,703.1	3,114.6	3,380.0	2,791.5	2,332.3	513.1	1,001.5	2,799.3
1997 Jan.	9,741.2	7,300.2	2,441.0	3,032.2	1,892.6	1,569.7	436.6	584.5	2,225.6
Feb.	9,823.9	7,253.8	2,570.1	3,007.4	1,928.7	1,594.7	447.8	594.5	2,250.8
March ...	10,053.1	7,366.5	2,686.6	3,096.4	1,995.3	1,617.2	456.7	601.2	2,286.3
Apr.	10,121.6	7,321.0	2,800.6	3,072.7	2,031.3	1,629.3	463.4	607.2	2,317.7
May	10,329.8	7,424.9	2,904.9	3,121.3	2,114.5	1,650.8	469.4	626.5	2,347.3
June	10,630.3	7,672.9	2,957.4	3,191.3	2,210.5	1,698.2	471.7	635.0	2,423.6
July	10,790.7	7,754.5	3,036.2	3,237.7	2,239.7	1,740.3	469.4	649.7	2,453.9
Aug.	10,814.8	7,830.0	2,984.8	3,218.1	2,248.9	1,765.5	463.4	658.9	2,460.0
Sept.	10,891.1	8,000.9	2,890.2	3,213.3	2,256.3	1,801.3	458.9	681.2	2,480.1
Oct.	10,921.3	8,152.1	2,769.2	3,208.4	2,269.8	1,837.5	454.6	697.8	2,453.2
Nov.	11,027.4	8,220.6	2,806.8	3,237.4	2,290.6	1,871.0	462.8	711.5	2,454.1
Dec.	11,145.8	8,407.5	2,738.3	3,185.4	2,316.9	1,924.4	464.7	731.6	2,522.8
1998 Jan.	11,256.7	8,423.0	2,833.7	3,228.4	2,350.9	1,953.9	466.1	743.3	2,514.1
Feb.	11,337.2	8,486.6	2,850.6	3,227.1	2,353.3	1,989.9	471.9	757.8	2,537.2
March ...	11,754.3	8,743.7	3,010.6	3,273.8	2,476.3	1,998.6	497.5	770.9	2,737.2
Apr.	11,854.4	9,254.8	2,599.6	3,244.2	2,568.1	2,031.0	505.3	777.4	2,728.4
May	11,941.8	9,325.5	2,616.3	3,229.3	2,621.6	2,058.6	497.7	800.7	2,733.9
June	12,127.2	9,404.6	2,722.6	3,239.1	2,605.2	2,094.2	505.4	820.6	2,862.7
July	12,152.7	9,407.1	2,745.6	3,252.2	2,618.5	2,136.3	495.6	844.6	2,805.5
Aug.	12,260.8	9,360.2	2,900.6	3,249.8	2,613.4	2,168.2	490.0	866.9	2,872.5
Sept.	12,313.6	9,457.1	2,856.5	3,252.4	2,684.1	2,206.5	484.3	890.5	2,795.8
Oct.	12,507.3	9,386.3	3,121.0	3,310.5	2,735.6	2,239.0	485.5	912.9	2,823.8
Nov.	12,542.9	9,447.7	3,095.2	3,323.2	2,714.0	2,274.2	493.2	934.3	2,804.0
Dec.	12,817.7	9,703.1	3,114.6	3,380.0	2,791.5	2,332.3	513.1	1,001.5	2,799.3
1999 Jan.	12,946.6	9,727.8	3,218.8	3,397.0	2,801.6	2,355.5	509.6	1,020.2	2,862.7
Feb.	13,010.5	9,693.5	3,317.0	3,390.0	2,764.6	2,386.2	515.3	1,035.8	2,918.6
March ...	13,218.9	9,727.6	3,491.3	3,429.6	2,784.6	2,429.8	527.4	1,109.5	2,938.0
Apr.	13,307.3	9,750.0	3,557.3	3,404.1	2,823.1	2,471.2	537.3	1,153.9	2,917.7
May*	13,571.6	9,980.8	3,590.8	3,408.9	2,959.9	2,523.0	540.9	1,184.7	2,954.2

* Provisional data.

Source: Bank of Greece.

Table IV.1

Public sector net borrowing requirement

(Billion drachmas)

	Year			January - April		
	1996	1997	1998*	1997	1998	1999[4]
1 Central government[1,2]	**3,691**	**2,585**	**2,357**	**478**	**800**	**869**
– Government budget	3,677	2,560	2,277	802	1,164	1,279
(Ordinary budget)	(2,991)	(1,664)	(1,210)	(764)	(1,003)	(982)
(Public investment budget)	(686)	(896)	(1,067)	(38)	(161)	(297)
– Special account of guarantees of agricultural products (ELEGEP)	14	25	80	–324	–364	–410
Percentage of GDP	12.4	7.9	6.6	1.5	2.2	2.3
2 Public entities[3]	**–647**	**–345**	**–535**	**–32**	**34**	**–130**
– Financing of social security funds	12	2	8	–2	19	2
– Financing of local authorities	31	6	4	–6	–5	–4
– Financing of other entities	–47	–23	–51	–6	13	–8
– Liquid assets	–643	–330	–496	–18	7	–120
General government (1+2)	**3,044**	**2,240**	**1,822**	**446**	**834**	**739**
Percentage of GDP	10.2	6.8	5.1	1.4	2.3	1.9
3 Public enterprises[2]	**83**	**–133**	**35**	**–3**	**–20**	**15**
– Financing of public utilities	57	–116	30	55	–36	38
– Financing of other enterprises	16	18	10	–7	49	7
– Liquid assets	10	–35	–5	–51	–33	–30
Public sector (1+2+3)	**3,127**	**2,107**	**1,857**	**443**	**814**	**754**
Percentage of GDP	10.5	6.4	5.2	1.4	2.3	2.0
Public sector (including capitalised interest)	3,306	2,142	1,882	455	822	754
Percentage of GDP	11.1	6.5	5.3	1.4	2.3	2.0
Memorandum items						
– Primary deficit of central government	–106	–638	–1,211	–646	–593	–621
– Amortisation payments	3,517	3,465	3,306	442	1,087	1,366
– Interest and related outlays	3,553	2,978	3,218	1,063	1,286	1,468
– Armed Forces' debt servicing	222	234	338	58	100	17
– ELEGEP interest	22	11	12	3	7	5

1 As shown by the movement of relevant accounts with the Bank of Greece, the Agricultural Bank of Greece and commercial banks, and by changes in external liabilities.
2 Including the movement of public debt management accounts.
3 As shown by investment in securities and bank deposits, and by changes in liabilities to banks.
4 Provisional data and estimates.
* Provisional data.

Source: Bank of Greece.

Table IV.2
Financing of the public sector borrowing requirement
(Billion drachmas)

	Year						January - April					
	1996		1997		1998 [3]		1997		1998		1999 [3]	
	Amount	Percentage of total	Amount	Percentage of total	Amount	Percentage of total	Amount	Percentage of total	Amount	Percentage of total	Amount	Percentage of total
Domestic borrowing	**2,834**	**90.6**	**967**	**45.9**	**–41**	**–2.2**	**465**	**105.0**	**–403**	**–49.5**	**–536**	**–71.1**
- Treasury bills and government bonds purchased by banks and specialised credit institutions	–168[1]	–5.4	94[1]	4.4	–737[1]	–39.7	282[1]	63.7	–971[1]	–119.3	7[1]	0.9
- Treasury bills and government bonds purchased by private savers and enterprises	3,113[1]	99.6	650[1]	30.8	160[1]	8.6	105[1]	23.7	448[1]	55.0	61[1]	8.1
- Loans and advances from specialised credit institutions and commercial banks	41	1.3	–4	–0.1	318	17.2	–292	–65.9	–22	–2.7	–408	–54.1
- Bank of Greece[2]	–152	–4.9	227	10.8	218	11.7	370	83.5	142	17.5	–196	–26.0
Foreign borrowing	**293**	**9.4**	**1,140**	**54.1**	**1,898**	**102.2**	**–22**	**–5.0**	**1,217**	**149.5**	**1,290**	**171.1**
Total	**3,127**	**100.0**	**2,107**	**100.0**	**1,857**	**100.0**	**443**	**100.0**	**814**	**100.0**	**754**	**100.0**

1 Including sales of securities in the secondary market.
2 As from 1 January 1994, this aggregate regards changes in the credit balance of the government's cash account with the Bank of Greece and not central bank financing.
3 Provisional data.

Source: Bank of Greece.

Table IV.3
Government budget balance
(Billion drachmas)

	Year				Percentage change			January - April			Percentage change	
	1996	1997	1998[5]	Budget 1999	1997/96	1998/97	Budget 1999/98	1997	1998	1999[5]	1998/97	1999/98
I. Revenue	7,952	9,186	10,441	11,090	15.5	13.7	6.2	2,343	2,720	2,984	16.1	9.7
1. Ordinary budget[1]	7,384	8,467	9,528	10,030	14.7	12.5	5.3	2,304	2,660	2,984	15.5	12.2
2. Public investment budget	568	719	913	1,060	26.6	27.0	16.1	39	60	0	53.8	–100.0
(Own resources)	(16)	(20)	(20)	(30)	(25.0)	(0)	(50.0)	(2)	(0)	(0)	(–100.0)	(–)
(Revenue from the EU)	(552)	(699)	(893)	(1,030)	(26.6)	(27.8)	(15.3)	(37)	(60)	(0)	(62.2)	(–100.0)
II. Expenditure[2]	14,460	15,279	16,090	16,976	5.7	5.3	5.5	3,616	4,902	5,591	35.6	14.1
1. Ordinary budget	13,365	13,653	14,209	14,781	2.2	4.1	4.0	3,339	4,534	5,039	35.8	11.1
- Amortisation payments[2,3]	3,638	3,589	3,542	3,731	–1.3	–1.3	5.3	479	1,154	1,376	140.9	19.2
- Ordinary budget without amortisation payments	9,727	10,064	10,667	11,050	3.5	6.0	3.6	2,860	3,380	3,663	18.2	8.4
(Interest payments and related outlays)[3]	(3,501)	(3,216)	(3,233)	(3,350)	(–8.1)	(0.5)	(3.6)	(1,007)	(1,114)	(1,357)	(10.6)	(21.8)
Ordinary budget primary expenditure	6,226	6,848	7,434	7,700	9.6	8.6	3.6	1,853	2,266	2,306	22.3	1.8
2. Public investment budget	1,095	1,626[6]	1,881[6]	2,195[6]	48.5	15.7	16.7	277	368	552	32.9	50.0
III. Government budget balance	–6,508	–6,093	–5,649	–5,886	–6.4	–7.3	4.2	–1,273	–2,182	–2,607	71.4	19.5
1. Ordinary budget	–5,981	–5,186	–4,681	–4,751	–13.3	–9.7	1.5	–1,035	–1,874	–2,055	81.1	9.7
2. Public investment budget	–527	–907	–968	–1,135	72.1	6.7	17.3	–238	–308	–552	29.4	79.2
Amortisation payments[2,3]	3,638	3,589	3,542	3,731	–1.3	–1.3	5.3	479	1,154	1,376	140.9	19.2
IV. Government budget net balance[4]	–2,870	–2,504	–2,107	–2,155	–12.8	–15.9	2.3	–794	–1,028	–1,231	29.5	19.7
1. Ordinary budget	–2,343	–1,597	–1,139	–1,020	–31.8	–28.7	–10.4	–556	–720	–679	29.5	–5.7
2. Public investment budget	–527	–907	–968	–1,135	72.1	6.7	17.3	–238	–308	–552	29.4	79.2
V. Primary surplus	631	712[6]	1,126[6]	1,195[6]				213	86	126		

1 Excluding revenue from privatisations.
2 Excluding payments for the redemption of Treasury bills held by the private sector.
3 Including Armed Forces' debt servicing.
4 Excluding amortisation payments.
5 Provisional data.
6 Including 421 billion drachmas in 1997, 487 billion drachmas in 1998 and 620 billion drachmas in the budget for 1999, concerning capital transfers for the acquisition of assets. Excluding these amounts, the primary surplus reaches 1,132 bilion drachmas for 1997, 1,613 billion drachmas for 1998 and 1,815 billion drachmas for 1999.

Source: Ministry of Finance, State General Accounting Office.

Table IV.4
Central government debt servicing[1]

(Billion drachmas)

	Year				Percentage change			January – April			Percentage change	
	1996	1997	1998 [2]	Budget 1999	1997/96	1998/97	Budget 1999/98	1997	1998	1999 [2]	1998/97	1999/98
Amortisation payments	3,517	3,465	3,306	3,511	–1.5	–4.6	6.2	442	1,087	1,366	145.9	25.7
(Drachmas)	(2,870)	(2,423)	(2,098)	(2,615)	(–15.6)	(–13.4)	(24.6)	(242)	(607)	(973)	(150.8)	(60.3)
(Foreign exchange)	(647)	(1,042)	(1,208)	(896)	(61.1)	(15.9)	(–25.8)	(200)	(480)	(393)	(140.0)	(–18.1)
Interest payments and related outlays	3,400	3,106	3,131	3,243	–8.6	0.8	3.6	986	1,081	1,350	9.6	24.9
(Drachmas)	(2,954)	(2,637)	(2,577)	(2,705)	(–10.7)	(–2.3)	(5.0)	(824)	(901)	(1,160)	(9.3)	(28.7)
(Foreign exchange)	(446)	(469)	(554)	(538)	(5.2)	(18.1)	(–2.9)	(162)	(180)	(190)	(11.1)	(5.6)
Total I	6,917	6,571	6,437	6,754	–5.0	–2.0	4.9	1,428	2,168	2,716	51.8	25.3
Interest and amortisation payments for servicing the Armed Forces' debt	222	234	338	327	5.4	44.4	–3.3	58	100	17	72.4	–83.0
(Amortisation payments)	(121)	(124)	(236)	(220)	(2.5)	(90.3)	(–6.8)	(37)	(67)	(10)	(81.1)	(–85.1)
(Interest payments)	(101)	(110)	(102)	(107)	(8.9)	(–7.3)	(4.9)	(21)	(33)	(7)	(57.1)	(–78.8)
Total II	7,139	6,805	6,775	7,081	–4.7	–0.4	4.5	1,486	2,268	2,733	52.6	20.5

1 Excluding redemption of Treasury bills held by the private sector.
2 Provisional data.

Source: Ministry of Finance, State General Accounting Office.