

MONETARY AND EXCHANGE RATE SITUATION IN THE SECOND HALF OF 1997

1. DEVELOPMENTS IN THE MAIN INTERNATIONAL MARKETS

1.1 Macroeconomic background

The behaviour of the main financial markets in the second half of 1997 chiefly reflected the cyclic position of the USA, Japan and Germany, namely its impact on expectations regarding monetary policy decisions.

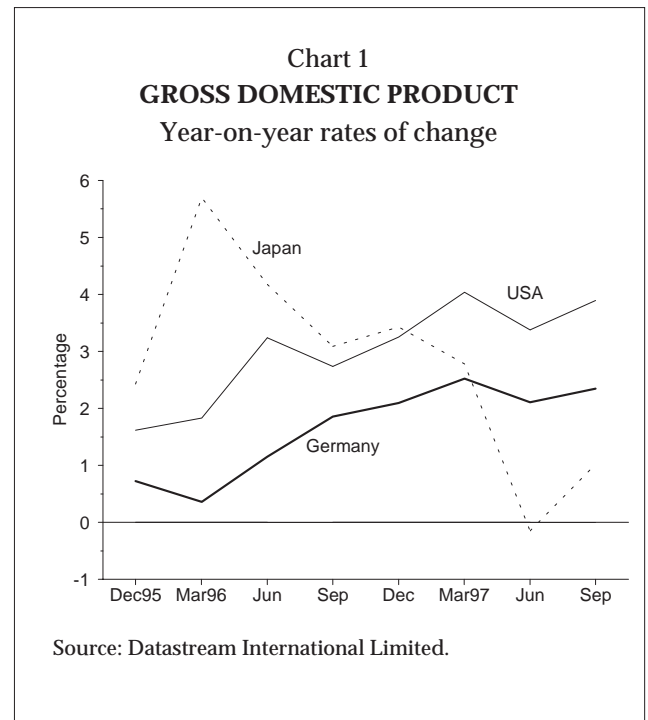
In parallel, the unexpected developments of the financial situation of the south-east Asian countries became an important conditioning to the macroeconomic background of the main international economies. The expectations regarding world inflation and economic growth were revised downwards, anticipating that the Asian crisis may have a greater impact on Japan (in comparison to the USA or to Europe).

The USA continued to present a high dynamism in the second half of 1997, without however having recorded an increase in inflation (chart 1).

The estimates released by the European Commission (EC) in Autumn 1997 revised upwards the economic growth for the USA in 1997 in relation to the Spring estimates, alongside lower values for inflation. The EC revised the rate of growth of GDP from 2.8 per cent to 3.6 per cent (which compares to 2.8 per cent in 1996). On the other hand, the estimated inflation rate fell from 2.3 per cent to 2.1 per cent (2.4 per cent in 1996).

In Japan, the prospects of economic growth for 1997 worsened, as economic activity is expected to record a slowdown in relation to 1996. According to the latest EC forecasts, GDP is expected to grow by 1.3 per cent in 1997, 0.3 percentage points below the Spring forecasts. In 1996, the Japanese economy grew by 3.5 per cent.

The behaviour of the financial markets in the European Union (EU) was influenced by the confirmation of the economic recovery in continental

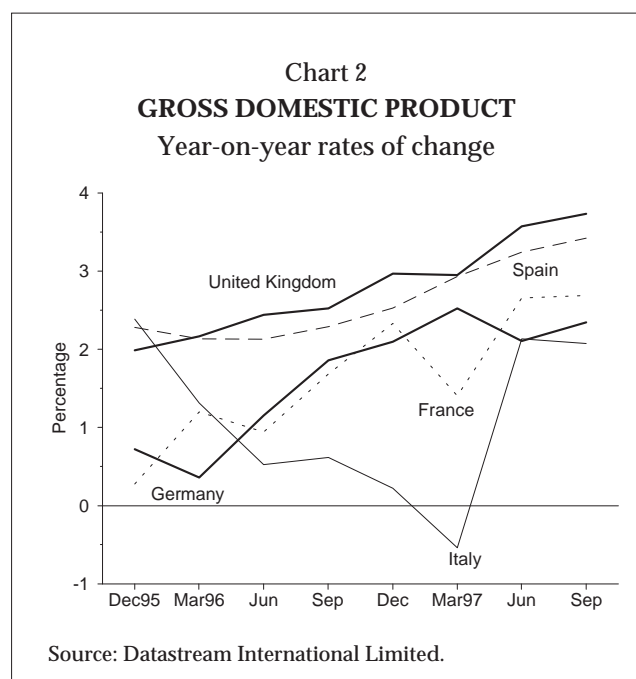


Europe in 1997, alongside the strengthening of the nominal convergence process, in the context of the preparation for the third stage of the Economic and Monetary Union.

The second half of 1997 was characterised by a prevalent sense of greater optimism regarding the growth of domestic product in the EU; in parallel, economic activity accelerated (chart 2). The EC Autumn forecasts confirm the economic recovery in 1997, estimating that the growth of output for the EU as a whole shall increase from 1.8 per cent in 1996 to 2.6 per cent in 1997 (2.2 per cent in the Spring forecasts).

The cyclical positions of the European economies is also estimated to have recorded some convergence, despite the fact that some countries stand in a more advanced stage of the of the economic cycle, as is the case of Ireland and the United Kingdom.

Although the European economy is expected to recover, the rate of unemployment in the EU is ex-



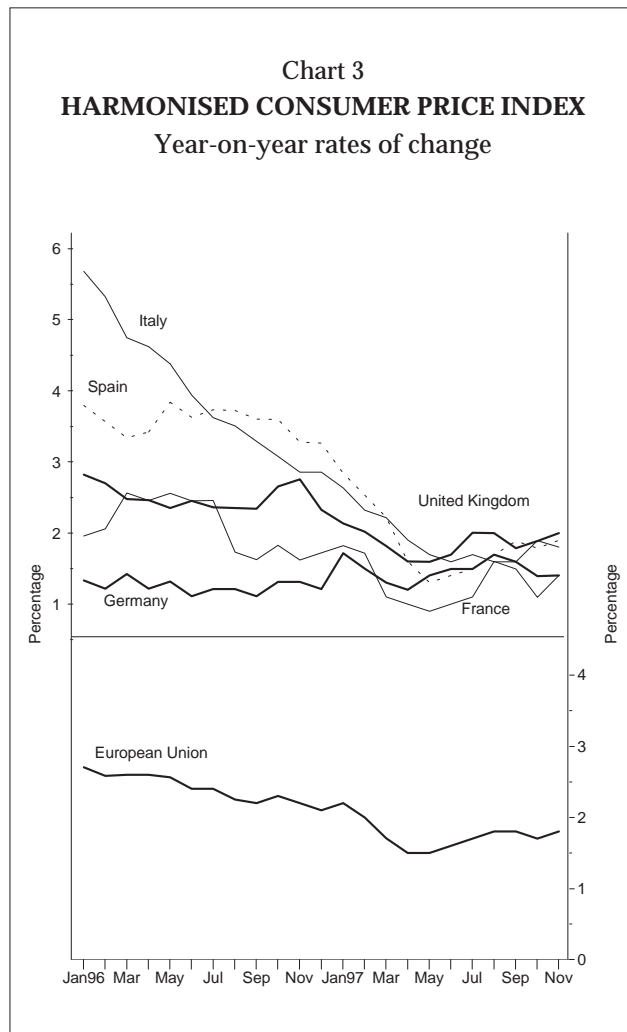
pected to remain at high levels. The EC forecasts indicate a 10.7 per cent rate in 1997 (10.9 per cent in 1996).

The improved expectation regarding economic growth in the EU were not followed by the strengthening of price pressures in the EU as a whole; in fact, in comparison to previous forecasts, inflation is expected to decrease slightly in 1997. The private consumption deflator published in Autumn by the EC accounts for a 0.5 percentage points decrease in relation to 1996, amounting to 2.1 per cent (2.2 per cent in the Spring forecast).

In 1997 the behaviour of inflation in the EU measured by the year-on-year rate of change of the Consumer Price Index (CPI), decreased up to April 1997, standing close to 2 per cent up to October — hence remaining slightly below the levels recorded early in the year.

The year-on-year rate of change of the Harmonised Consumer Price Index (HCPI) stood systematically below two per cent in 1997, except in January (2.2 per cent); in November 1997, the HCPI amounted to 1.8 per cent (chart 3).

The average rate of change of the HCPI for the EU as a whole maintained its downward trend over the course of 1997. On its turn, the reference value for the application of the price stability criterion defined in the European Union Treaty remained stable at 2.5 per cent from December 1996 up to June 1997, increasing in the second half of



the year. In November, this value stood at 2.8 per cent⁽¹⁾.

Price deceleration in the EU as a whole was followed by the reduction in the inflation differentials between countries, sometimes greater than that expected. This behaviour was due both to the maintenance of the disinflationary process in the countries typically exhibiting higher inflation rates, and to the slight increase in the inflation rates of countries with the best performance regarding price stability.

In the second half of 1997, the EU countries strengthened their budgetary consolidation efforts, developed within the convergence process; the differences between the public accounts situation in the Member-States narrowed, namely in what concerns the public deficit. According to the

(1) This reference value is calculated as the average of the three lowest EU annual inflation rates plus 1.5 percentage points.

EC, all European countries which in 1996 recorded a budgetary deficit are expected to improve in 1997. For the EU as a whole, the EC forecasts a 2.7 per cent deficit to GDP ratio in 1997 (4.3 per cent in 1996).

1.2 Monetary and financial developments

In the exchange rate market, the US dollar appreciated 11.2 per cent vis-à-vis the yen in annual average terms in 1997, and 15.3 per cent vis-à-vis the Deutsche mark.

In the second half of 1997, the US dollar appreciated, on average, by 0.8 per cent vis-à-vis the yen and 5.8 per cent vis-à-vis the Deutsche mark⁽²⁾, alongside an increase in its volatility (charts 4 and 5). This behaviour does not reflect, however, the behaviour of the dollar exchange rate vis-à-vis these two currencies over the course of the half-year. Indeed, in end-of-period terms⁽³⁾, the dollar appreciated only 2.8 per cent vis-à-vis the Deutsche Mark and over 13 per cent vis-à-vis the yen.

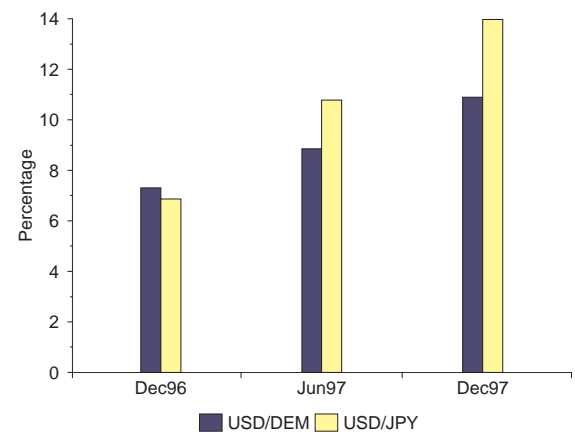
As mentioned above, the dollar appreciated significantly vis-à-vis the yen in the second half of 1997, unlike what occurred in the late first-half. At the end of 1997, the US dollar recorded historical maxima vis-à-vis the yen, comparable to those reached in May 1992.

The behaviour of the yen was affected by the weakness of the Japanese economy and by the deterioration of expectations regarding its future developments, while the USA kept exhibiting a significant economic growth.

The weakening of the yen was also determined by the financial instability exhibited by the south-east Asian countries over the course of the second half-year (charts 6 and 7). This instability was at first characterised by exchange rate pressures associated to the Thai currency, spreading rapidly to other currencies, and culminating in the abandon of the exchange rate regimes in many countries (in general linked to the US dollar). The south-east



Chart 5
VOLATILITY OF THE DOLLAR VIS-À-VIS THE DEUTSCHE MARK AND THE YEN



Note: Annualised standard deviation of the daily change in the exchange rate for the last six months.

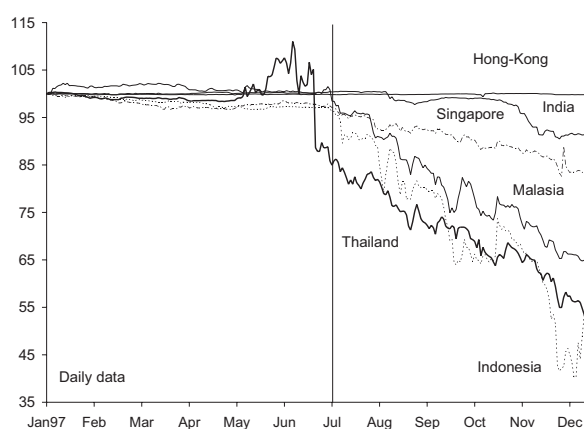
Asian financial crisis influenced the remaining international markets — specially the Japanese financial sector, where this phenomenon led to the capital outflow into countries exhibiting lower risk premia, namely to the USA, Germany and Switzerland.

In the context of the Asian crisis, the worsening of the situation in the stock markets in late October should be singled out. This development led to the crash in the Hong-Kong stock exchange, triggering negative influences world-wide, namely in the Japanese, USA and German stock exchanges. However, in end-of-period terms, the Dow Jones and DAX indices increased by 4.1 and 10.9 per cent

(2) The average changes referring to the second half of 1997 and 1997 as a whole correspond to the change between the average values of the two half-years of 1997 in the former case, and to the change between the averages for 1996 and 1997 in the latter.

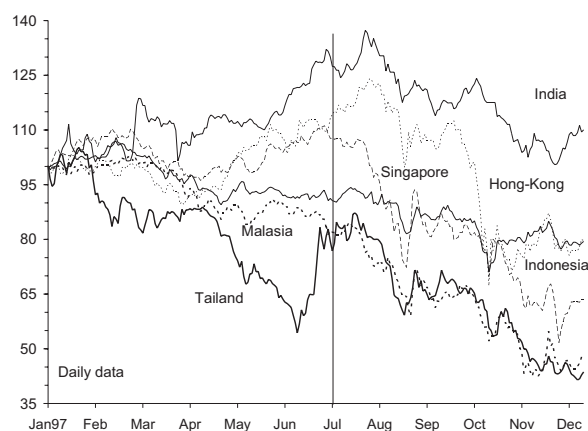
(3) End-of period changes are calculated on the average values of December and June 1997.

Chart 6
EXCHANGE RATE INDICES OF THE SOUTH-EAST ASIAN CURRENCIES VIS-À-VIS THE DOLLAR
1 January 1997 = 100



Note: (+) appreciation; (-) depreciation.

Chart 7
STOCK INDICES OF THE SOUTH-EAST ASIAN COUNTRIES
1 January 1997 = 100

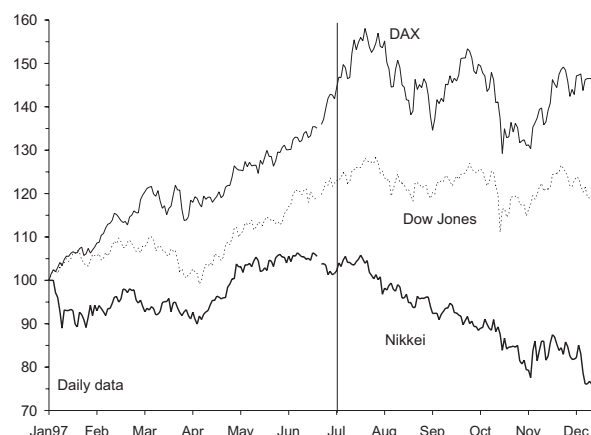


respectively, while the Nikkei index fell by 22.4 per cent⁽⁴⁾. The reduction in the amounts invested in shares in Japan by foreign investors over the course of the second half of 1997 resulted in a fall in stock prices and contributed to the weakening of the yen.

In the second half of 1997, the trend of appreciation of the US dollar vis-à-vis the Deutsche mark was finally broken, after a DM 1.89 peak

(4) In late 1997, the Nikkei index exhibited minimum levels, comparable to those recorded in mid-1995.

Chart 8
DOW JONES, DAX AND NIKKEI STOCK INDICES
1 January 1997 = 100



reached in early August. This inversion is mainly explained by the acceleration of the German economy and by the emergence of some inflationary risks, which rose expectations regarding increases in the German interest rates, which came to happen in early October. Up to then, the depreciation of the US dollar might have been influenced by the expectation that the USA would be more affected by the Asian crisis than the German economy. However, in the two last months of 1997, this currency appreciated vis-à-vis the Deutsche mark, reflecting not only a re-evaluation of the impact of the Asian crisis on the USA and on Germany, but also a revision of expectations regarding the behaviour of the interest rate differentials between these countries. This revision might have been partly linked to the expected impacts of the Asian crisis on the economic growth, and on the behaviour of prices in both countries.

During Summer 1997 expectations regarding increases in the official interest rates by the Bundesbank were reinforced⁽⁵⁾, which became effective on 9 October. On this date, the German repo rate was raised by 0.3 percentage points, to 3.3 per cent (chart 9). This decision consisted of a preventive action by the German central bank, given the lag with which the monetary policy measures affect the behaviour of prices. Those expectations, which up to mid-October resulted in an increase in the interest rates implicit in futures contracts over

3-month interest rates of the Deutsche mark were partly corrected in the last two months of 1997 (chart 10).

On the other hand, the absence of indications of increasing inflationary risks in the USA led to a revision of expectations regarding the behaviour of official interest rates, over the course of the second half of 1997. Instead of expecting a raise, the market started to ascribe a higher probability to the eventual maintenance of the reference rate of the Fed Funds, which came to take place. This revision resulted in a fall in the interest rates implicit in the futures contracts over the US dollar 3-month interest rates (chart 11).

In what concerns the yen, the interest rates implicit in the futures contracts recorded a downward behaviour similar to that of the US dollar, though steeper than the latter. This behaviour reflected a virtual dissipation of expectations regarding increases in the short-term interest rates, as a reaction to the worsening of the Japanese economic context, aggravated by possible effects of the Asian crisis.

In end-of-period terms, the 3-month interest rates of the US dollar remained fairly stable, amounting to 5.8 per cent in December. In Japan, these rates increased by 0.3 percentage points, standing at 0.9 per cent; this behaviour reflects the increase in the risk premium associated to investments denominated in yen. In Germany, these rates increased by 0.6 percentage points, to 3.6 per cent at the end of the second half of 1997.

The behaviour of the long-term interest rates in the USA, Japan and in Germany in the second half of 1997 was characterised by a downward trend, reflecting among other factors the expected behaviour of inflation. This movement was more pronounced in Japan and in the USA (reductions of 0.7 percentage points) than in Germany (0.4 percentage points decrease).

The dollar and the Deutsche mark 10-year bond yields fell by 0.5 percentage points in relation to

(5) In August, the decision of the Bundesbank towards making the conditions of liquidity injection more flexible might have contributed to expectations regarding the increase in interest rates. Thereafter, the Bundesbank began to announce weekly liquidity injection operations on the days these take place, instead of the former fortnight announcements made after the meeting of the Monetary Policy Council.

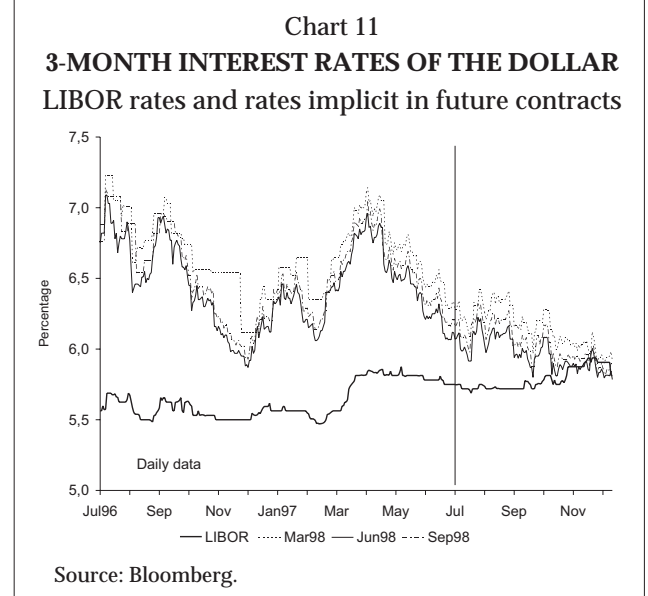
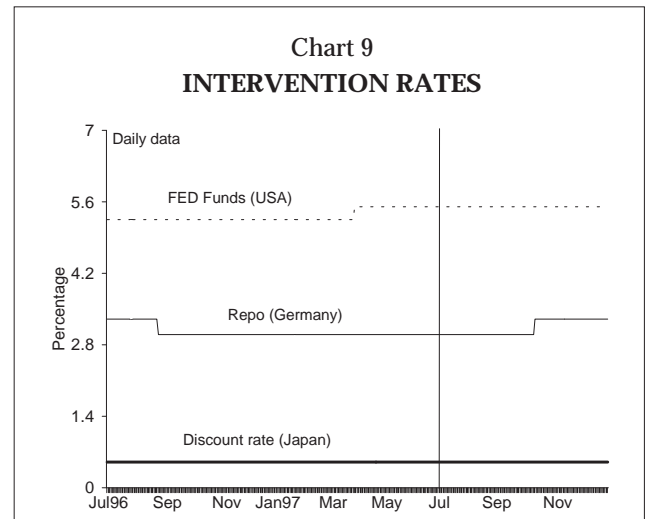
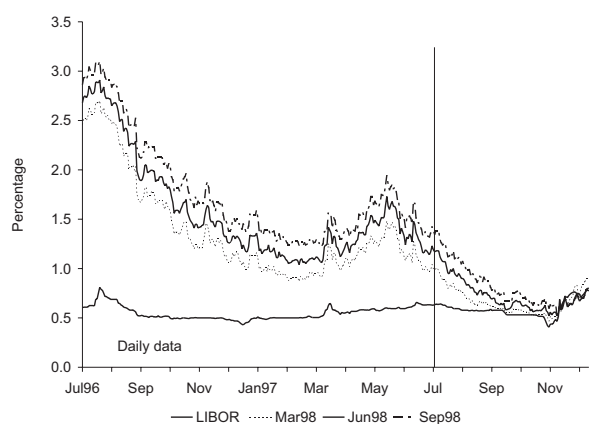
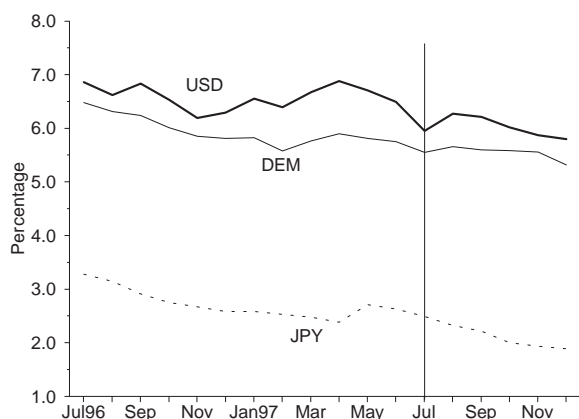


Chart 12
3-MONTH INTEREST RATES OF THE YEN
 LIBOR rates and rates implicit in futures contracts



Source: Bloomberg.

Chart 13
10-YEAR BOND YIELDS
 Monthly averages

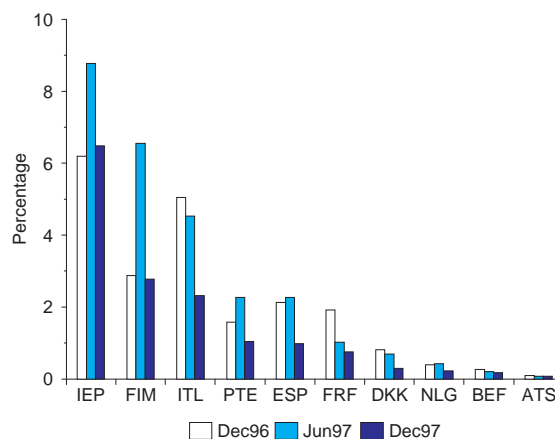


December 1996, while the yen yields decreased by 0.7 percentage points.

At the end of 1997, the 10-year interest rates stood at 1.9 per cent in Japan (where new historic minima were reached), 5.9 per cent in the USA and 5.3 per cent in Germany (chart 13). In the second half-year as a whole, the differential between the USA and the German 10-year yields narrowed by about 0.3 percentage points.

The Exchange Rate Mechanism (ERM) of the European Monetary System (EMS) remained stable in the second half of 1997, with most partici-

Chart 14
VOLATILITY OF THE ERM CURRENCIES
 VIS-À-VIS THE DEUTSCHE MARK

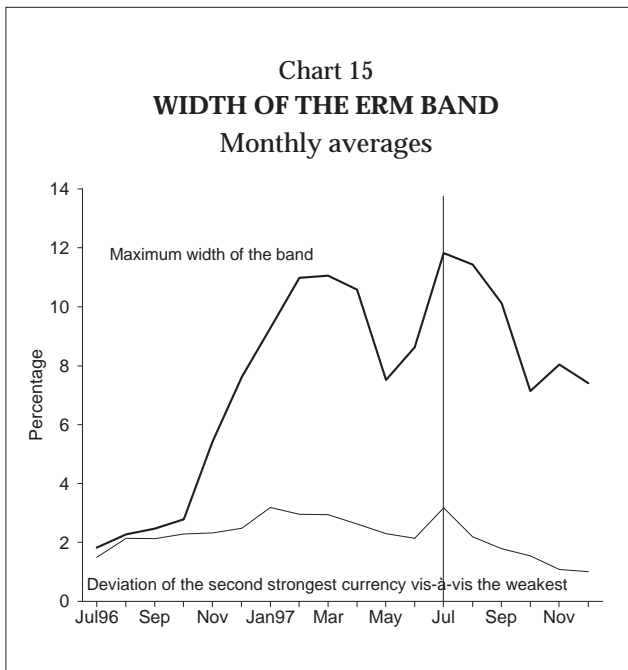


Note: Annualised standard deviation of the daily change in the exchange rate for the last six months.

pating currencies exhibiting a decrease in their volatility (chart 14).

The reinforcement of the cohesion between the currencies participating in the ERM was mainly due to the strengthening of the nominal convergence process and to the increasing perception of the sustainability of such results. Against this background the political-institutional engagement of national authorities was decisive; in this context the proceedings of the informal meeting of ECOFIN in Mondorf (on 12 to 14 September) should be highlighted. This decision determined the pre-announcement of the bilateral exchange rates to support the calculation of the rates of conversion into euro in early 1999. This announcement shall take place in May 1998, when the list of the first group of countries entering the euro area is to be disclosed.

The behaviour of the spot and forward markets in the framework of the ERM of the EMS over the course of the second half of 1997, was characterised by a convergence of most currencies towards the respective bilateral central parities; this behaviour took place in a context where the sensitivity to changes in the US dollar is estimated to have decreased. The Maximum width of the band of the ERM stood at 7.5 per cent in December, below that recorded late in the first half of 1997, which reflects the behaviour of the Irish pound. This cur-

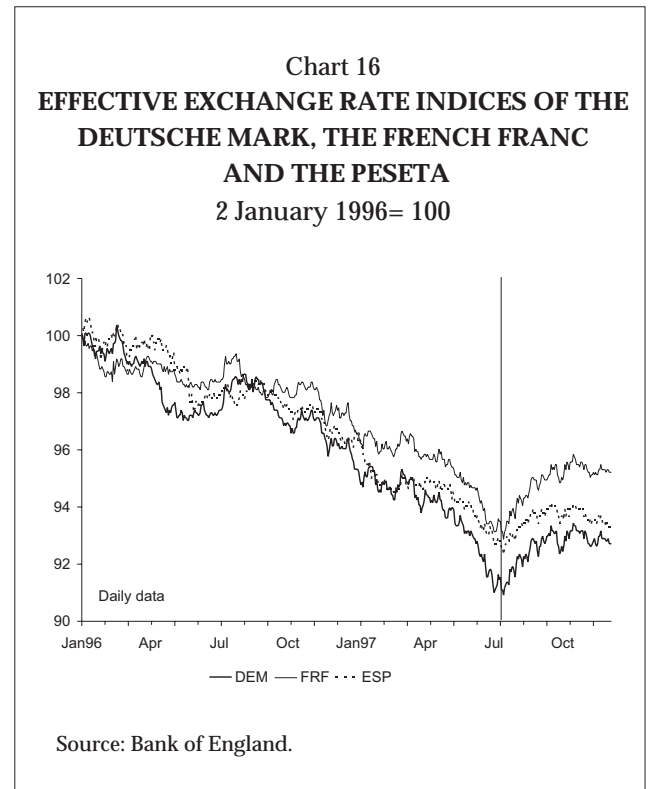


rency kept recording the greatest deviations (in percentage terms) from the bilateral central exchange rates in the ERM of the EMS, remaining as the strongest currency in the System. In fact, if excluding the Irish pound, the spread of the ERM band narrowed to 1.0 per cent in December, about 1.2 percentage points less than in June 1997 (chart 15).

In the second half of 1997, the Deutsche mark exhibited no expressive fluctuations vis-à-vis any other currency in the ERM of the EMS. On average, the Italian lira presented changes with the greatest spread vis-à-vis the Deutsche mark, appreciating by about 1.0 per cent. However, in end-of-period terms, this appreciation amounted to only 0.1 per cent.

Comparing the average values of December 1997 with those of June, the widest changes were those exhibited by the French franc and by the Finnish currency, although in opposite directions. The French franc appreciated close to 0.8 per cent vis-à-vis the Deutsche mark (in the half-year, this currency appreciated on average by 0.4 per cent), while the Finnish currency depreciated 0.9 per cent (0.2 per cent on average in the second half-year).

As regards the behaviour of the Deutsche mark vis-à-vis the currencies outside the ERM of the EMS, the appreciation of the Sterling by 5.9 per cent in average terms (3.7 per cent in end-of-period terms) should be singled out. The behav-



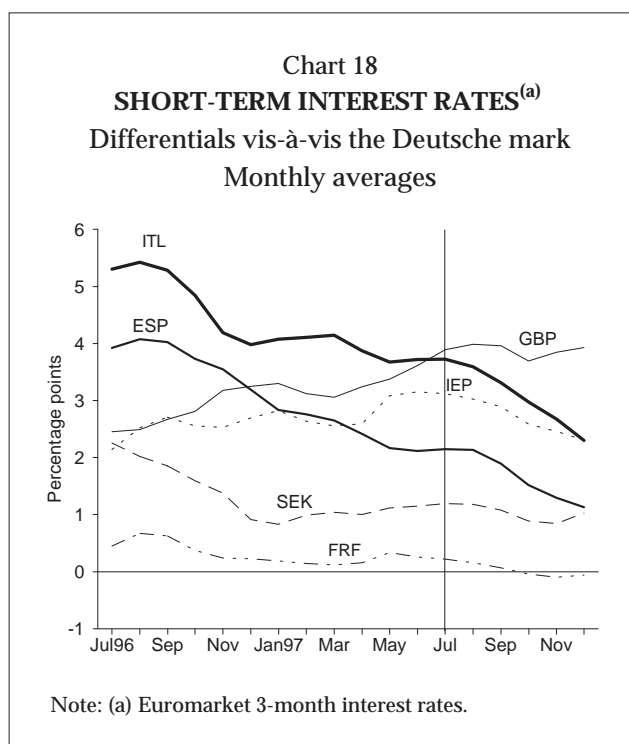
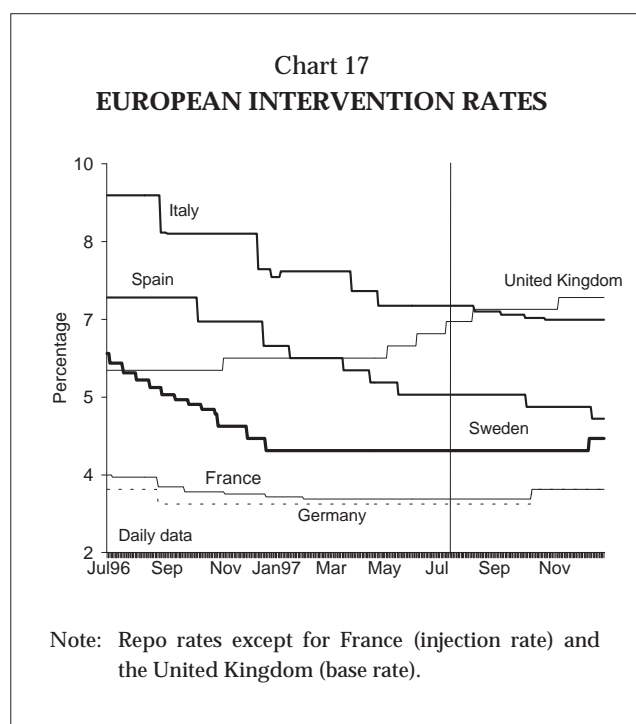
our of the dollar vis-à-vis the Deutsche mark and the different position in the cycle exhibited by the British economy when compared to Germany conditioned the behaviour of the pound.

In the second half of 1997, some currencies in the ERM — namely the Deutsche mark, the French franc and the Peseta — interrupted the nominal effective depreciation process recorded in the first half of the year, inverting the trend slightly (chart 16).

The distinct domestic macroeconomic frameworks of the European countries resulted in different reactions by the monetary authorities over the course of the second half of 1997 (chart 17). In this context, the official interest rates of the countries participating in the ERM of the EMS came closer.

Among the countries participating in the ERM of the EMS, a first group of Member-States (Denmark, Belgium, Germany, France and Austria) held unchanged the respective official interest rates up to October 1997, after which these rates followed the rise of the German repo rate. In October 1997, the differential between this rate and the intervention rate of the Banque de France disappeared.

Before October 1997, a second set of countries had already raised their official interest rates, re-



flecting the need to contain some inflationary pressures (Finland and the Netherlands, the latter raising its official rate in October as well).

Finally, a third group of countries (including Spain and Italy) cut their official interest rates⁽⁶⁾. The Bank of Spain cut its repo rate by a total of 0.5 percentage points, down to 4.75 per cent. In Italy, the downward movement of the repo rate culminated in an adjustment of the discount rate by 0.75 percentage points at the end of the year, to 5.50 per cent. These measures were influenced by the behaviour of the inflation rate, the reduction of the budgetary imbalance and, in general, the progresses achieved in what concerns macroeconomic stability.

As regards the non-participating countries in the ERM of the EMS, the rise in the official interest rates in the United Kingdom and in Sweden in the second half of 1997 are worth being noted. The British base rate was increased by a total of 0.75 percentage points, amounting to 7.25 per cent at the end of the year. In Sweden, the repo rate was raised from 4.10 per cent to 4.35 per cent at the end of the second half of 1997. The resolution of the Riksbank is explained by the position of the Swed-

(6) See section 2 for the Portuguese case.

ish economy, which is at a more advanced stage of the economic cycle.

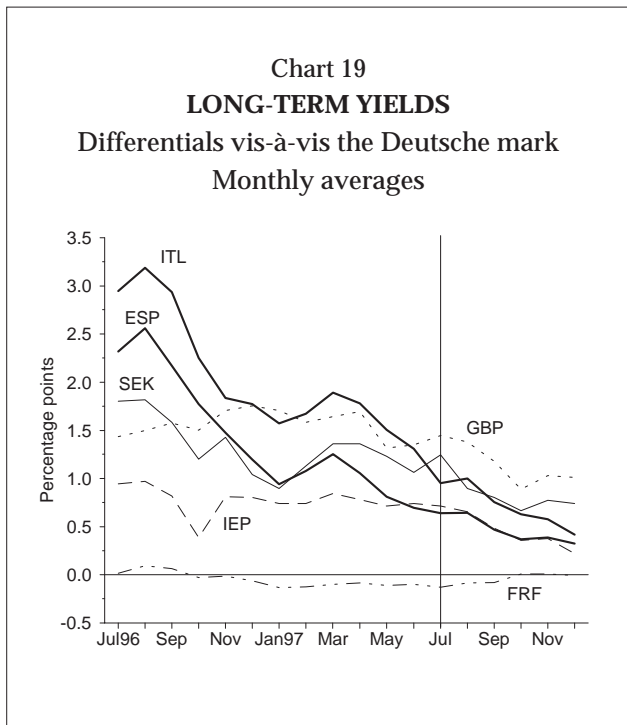
The 3-month interest rates reflected the monetary policy measures taken in the second half of 1997. These interest rates increased significantly in the United Kingdom (0.9 percentage points) and in Germany (0.6 percentage points), standing at 7.6 per cent and 3.6 per cent in December 1997, respectively.

On the contrary, short-term interest rates decreased in Spain and in Italy; the short-term interest rate of the peseta fell by 0.4 percentage points, while that of the lira fell by 0.8 percentage points. At the end of 1997, these rates amounted to 4.8 per cent and 5.9 per cent, respectively.

In Ireland, although the central bank maintained the official interest rates unchanged throughout the half-year, the short-term interest rates of the Irish pound decreased (0.3 percentage points) reaching 5.9 per cent in December. This reduction was related to expectations regarding a possible fall in the official interest rates in the future.

Except for the Sterling, the differential of most currencies' short-term interest rates vis-à-vis the German rates narrowed (chart 18).

The European long-term interest rates exhibited a downward trend in the second half of 1997,



converging towards the German rates (chart 19). This behaviour was particularly evident in the Italian, Irish, Spanish and British cases.

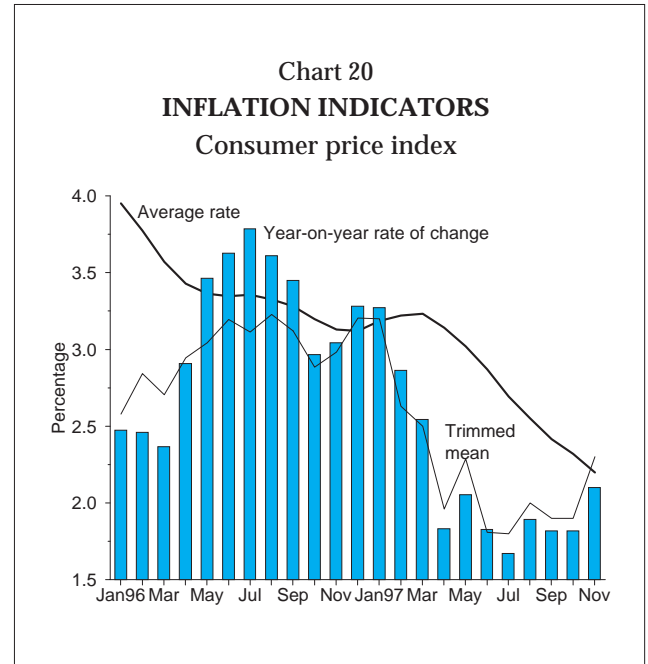
2. MONETARY AND EXCHANGE RATE POLICY IN PORTUGAL

2.1 Macroeconomic background

The behaviour of Portuguese economy throughout 1997 was characterised by the continuing of the disinflationary and budgetary consolidation processes, alongside a significant growth of economic activity.

After the acceleration exhibited in 1996, the Portuguese economy is expected to keep growing at a high pace in 1997. The forecast built by the Banco de Portugal disclosed in the September 1997 Economic Bulletin, revised upwards the lower limit of the interval released in March; GDP is now estimated to grow between 3.25 per cent and 3.75 per cent in real terms in 1997, which compares to an estimated growth of 3.3 per cent in real terms for 1996. Therefore, the Portuguese economy shall record, for the second year around, a growth rate above that of the EU, evaluating by the EC forecasts released in Autumn.

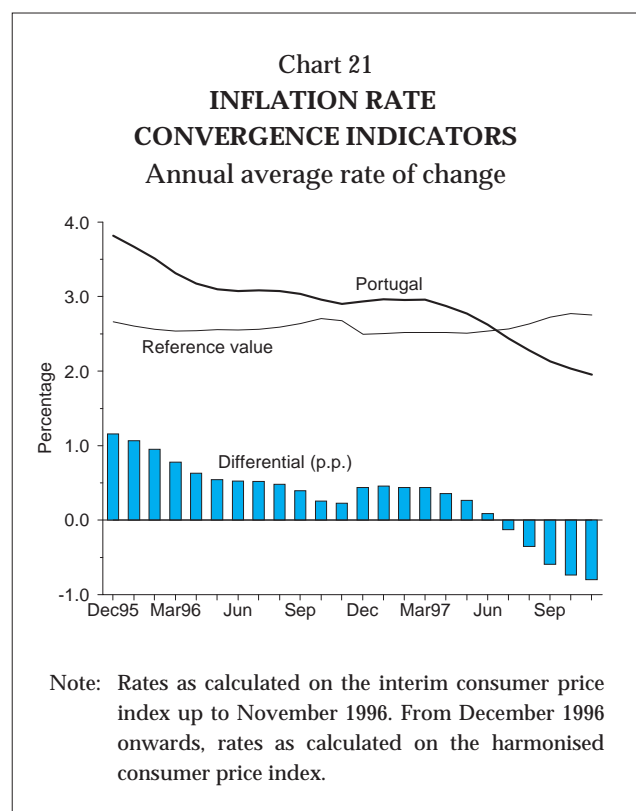
The disinflationary process, started late 1990, proceeded throughout the second half of 1997. In-



flation, measured by the annual average change of the Consumer Price Index (CPI), maintained its downward trend, falling from 2.9 per cent in June to 2.2 per cent in December, which compares to 3.1 per cent in 1996 as a whole (chart 20). In year-on-year terms, the CPI remained fairly stable, exhibiting values close to 2 per cent since April. In December 1997, the year-on-year rate of change of the CPI amounted to 2.3 per cent as against 3.3 per cent in December 1996. The information contained in the behaviour of the trend indicators throughout the second half of 1997 indicate the same developments.

In July 1997, the average rate of change of the HCPI for Portugal stood for the first time below the reference value for the application of the price stability convergence criterion (chart 21). In this month, the average rate of change of the HCPI amounted to 2.4 per cent, which compares to a reference value of 2.6 per cent. Thereafter, the average inflation in Portugal, measured by the HCPI has remained systematically below that value, reaching 1.9 per cent in December (0.8 percentage points below the reference value). Therefore, at the end of 1997, the average rate of change of the HCPI stood below the level considered relevant to the prosecution of monetary policy by the Banco de Portugal (2.25 per cent).

The September 1997 notification of the Ministério das Finanças to the EC (in the context of the ex-



cessive deficit procedure) confirmed the estimate for the deficit of the General Government (GG) for 1997, which amounts to 2.9 per cent of GDP. Therefore, for the first time since the European Union Treaty was put into force, Portugal is expected to record a value below the reference value of 3 per cent.

According to the same notification, the GG gross debt to GDP ratio in 1997 was revised downwards, from 64.0 per cent to 63.2 per cent⁽⁷⁾. This revision was chiefly determined by the increase in the revenue from privatisation allocated to debt redemption, when compared to that previously projected.

The State Budget Law for 1998, approved in November, estimates a public deficit amounting to 2.5 per cent of GDP, which again indicates a value below the reference level defined in the respective convergence criterion (3 per cent). The value indicated for the GG deficit is identical to the target value defined in the Convergence, Stability and Growth Programme approved in March 1997. As in the programme, the State Budget Law for 1998

(7) According to information later to the preparation of this document, this ratio will again be revised downwards.

has underlying the continuing of the downward trend of the public debt ratio, initiated in 1995.

2.2 Implementation of monetary and exchange rate policies

In 1997, the escudo recorded an average appreciation of 1.4 vis-à-vis the Deutsche mark when compared to 1996 as a whole. The volatility of the escudo against the Deutsche mark remained low, at levels similar to those exhibited in 1996.

In the second half of 1997, the escudo depreciated 1.2 per cent vis-à-vis the Deutsche mark, in both annual average and end-of-period terms, hence inverting the appreciation recorded in the first half of the year. In December, the escudo recorded values close to those exhibited in September 1996.

In the context of the ERM of the EMS, the escudo was systematically traded above the bilateral central rate vis-à-vis the Deutsche mark; the spread between those rates narrowed from 1.5 per cent late in the first half of the year, to 0.3 per cent in December 1997 (chart 22).

The fairly stable value of the escudo vis-à-vis the currencies participating in the ERM of the EMS resulted in an appreciation against this set of currencies, of 1.1 per cent in 1997 (chart 23). In the second half of 1997, the escudo depreciated on average by 1.4 per cent, when measured by the EER-ERM (1.3 per cent between June and December

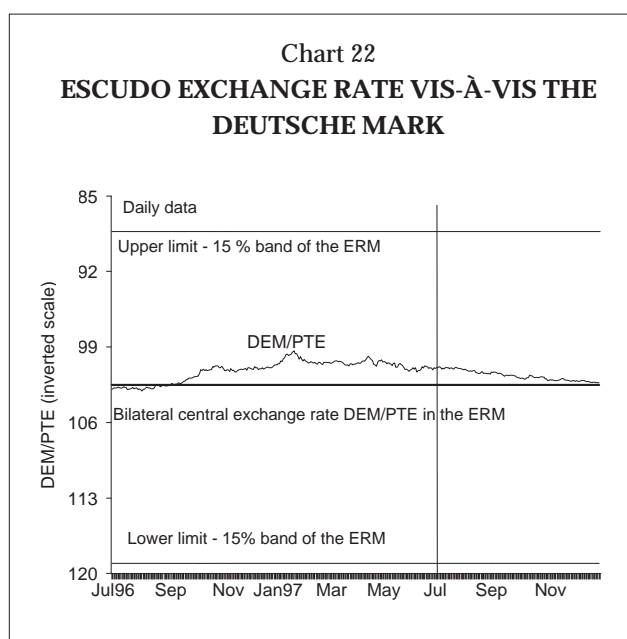
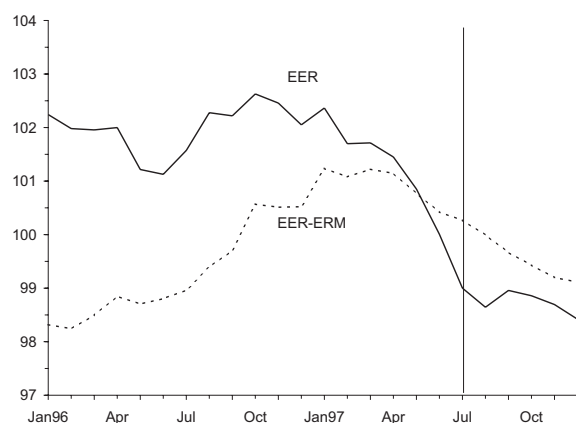
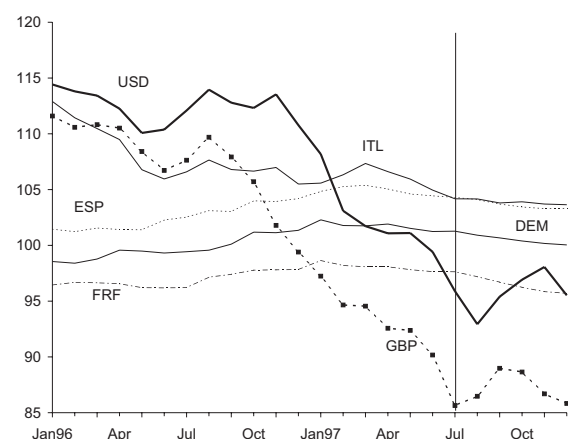


Chart 23
EFFECTIVE EXCHANGE RATE INDEX AND
ERM-EXCHANGE RATE INDEX
August 1993= 100
Monthly averages



Note: (+) appreciation; (-) depreciation.

Chart 24
INDICES OF THE ESCUDO EXCHANGE RATE
VIS-À-VIS THE DOLLAR, STERLING,
DEUTSCHE MARK, FRENCH FRANC,
PESETA AND ITALIAN LIRA
August 1993=100
Monthly averages



Note: (+) appreciation (-) depreciation.

1997); this development took place in a context where the behaviour of the escudo and that of the remaining currencies in the ERM against third currencies exhibited some resemblance.

In nominal effective terms, the escudo depreciated 1.9 per cent in 1997. In the second half of

1997, the escudo exhibited higher stability than in the first half. It should be noted that in the former half-year, the Effective Exchange Rate Index (EER) had recorded a downward trend, in line with the behaviour of other currencies in the ERM. In nominal effective terms, the escudo depreciated 1.6 per cent in end-of-period values, and 2.6 per cent in average terms. The US dollar and the Sterling were the currencies contributing the most to the described behaviour of the EER (chart 24).

Over the course of the second half of 1997, the Banco de Portugal again cut its intervention rates. The monetary policy measures reflected the exchange rate stability within the ERM, as well as the expectations regarding inflation, in a context where the budgetary consolidation process proceeded. The rates of liquidity absorption and the emergency lending rate were cut by 0.8 percentage points throughout the second half of 1997, standing at 4.9 per cent and 6.9 per cent respectively, since mid-November. The repo rate was cut by 0.7 percentage points, amounting to 5.3 per cent since mid-November (table 1 and chart 25).

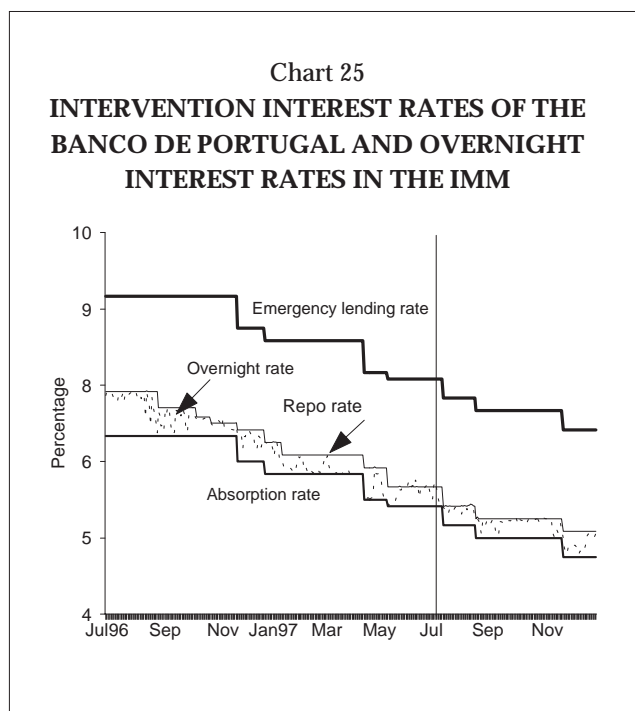
When compared to late 1996, the reductions in the intervention rates amounted to 1.3 percentage points as regards the rate of liquidity absorption, and 1.4 percentage points in both the emergency lending rate and the repo rate. The differential between the latter and the German repo rate narrowed 1.7 percentage points in 1997, amounting to 2 percentage points since mid-November.

In the second half of 1997, the short-term interest rates kept decreasing, alongside the reductions in the intervention rates. The 3-month interest rate of the escudo stood at 5.0 per cent in December,

Table 1

INTERVENTION RATES OF THE
BANCO DE PORTUGAL

Percentage	Percentage		
	Absorption rate	Repo rate	Emergency lending rate
6/30/97.....	5.7	6.0	7.7
7/11/97.....	5.4	5.7	7.4
8/18/97.....	5.2	5.5	7.2
11/18/97.....	4.9	5.3	6.9



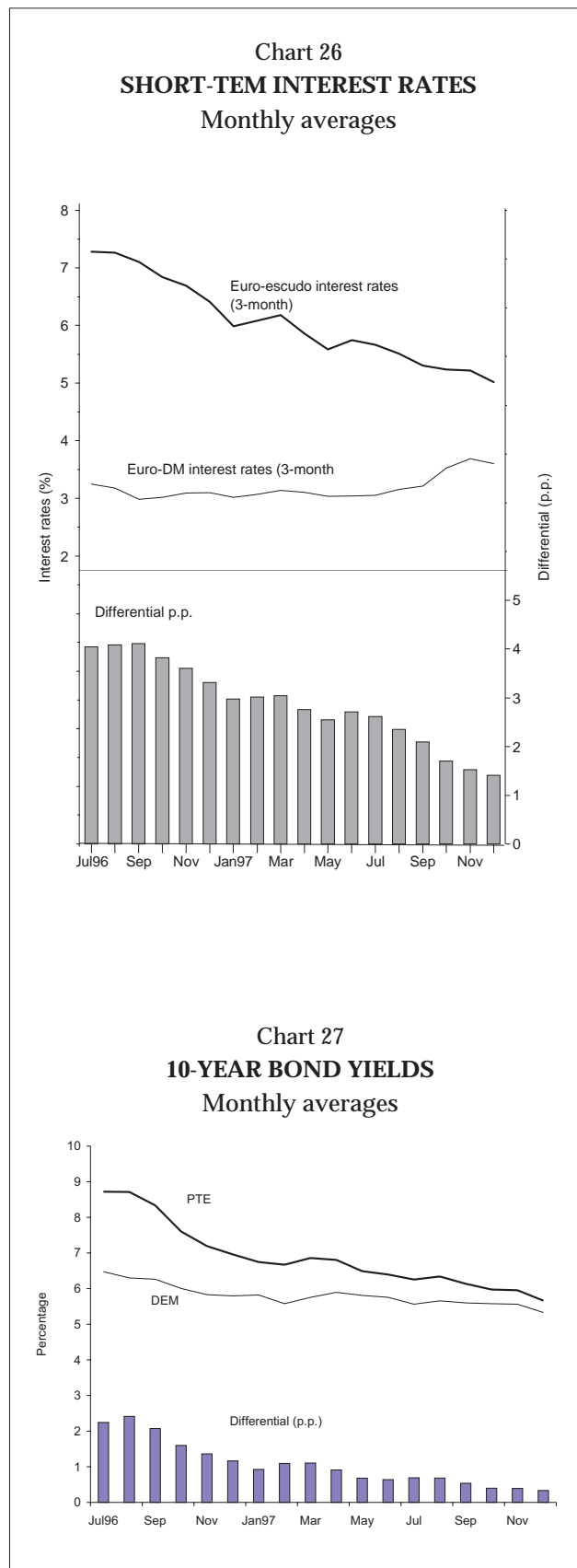
which accounts for a 0.7 percentage points reduction in relation to June 1997. When compared to late 1996, the short-term interest rates of the escudo fell 1.4 percentage points, hence being among the EU rates which fell the most in 1997 (chart 26).

The short-term interest rate differential vis-à-vis the German rates narrowed 2.7 percentage points in June, to 1.4 percentage points in December 1997. At the end of 1996, this differential amounted to 3.3 percentage points.

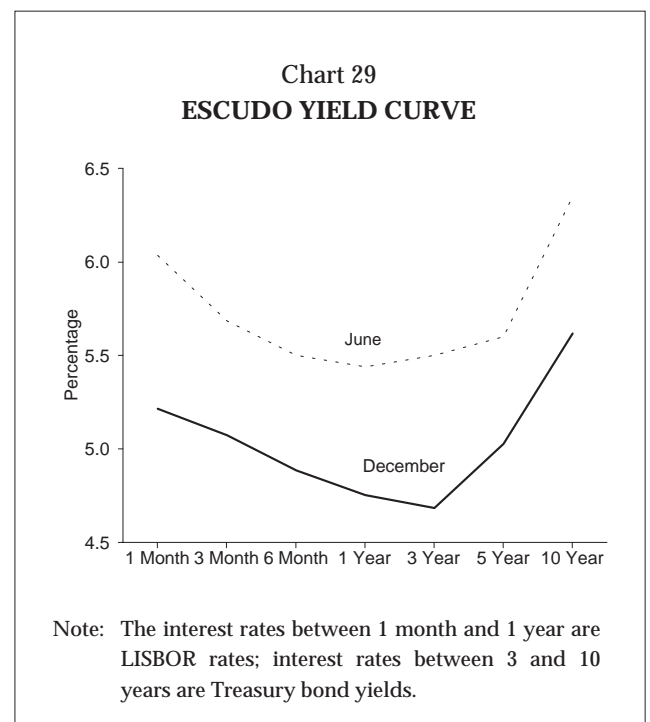
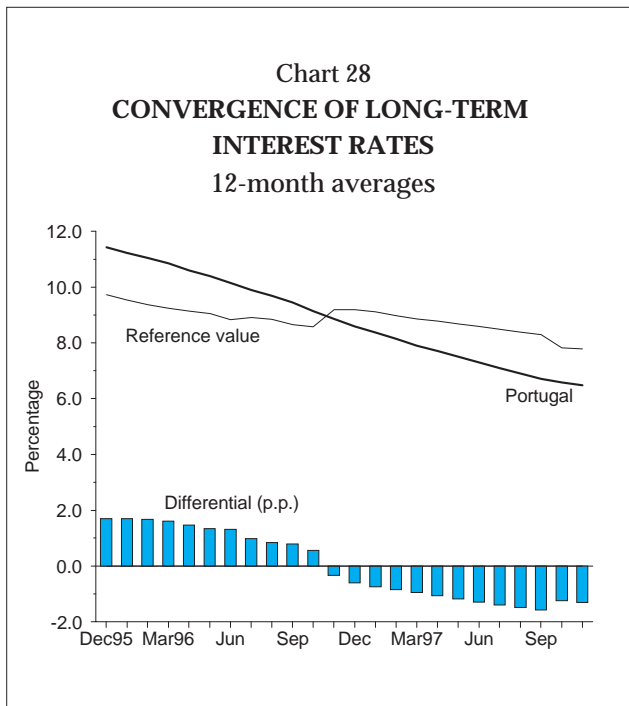
In the second half of 1997, the money market exhibited a shortage of liquidity on average, as had been recorded since the last week of May onwards. The Banco de Portugal did not issue Monetary Intervention Certificates in the second half of the year, which led to a null live balance of these securities in July 1997.

In early November, the second tranche of Deposit Certificates (DC) of the Banco de Portugal, corresponding to the liquidity absorption operation following the application of the new cash reserve scheme (3-year A series, non-remunerated) came into maturity. The maturity of the deposit certificates rose the liquidity in the money market, hence the Banco de Portugal intervened by absorbing liquidity.

In the second half of 1997, the Portuguese long-term interest rates maintained their downward



trend, specially after the informal ECOFIN meeting held in Mondorf in mid-September, from which resulted improved expectations regarding



the creation of the single currency in 1999 (chart 27). In December, the 10-year bond yields of the escudo averaged 5.7 per cent, 0.7 percentage points less than in June 1997. The long-term differential vis-à-vis Germany narrowed 0.3 percentage points between June and December, standing at 0.3 percentage points at the end of the year (which compares to 1.2 percentage points in December 1996).

Throughout the second half of 1997, the annual average of long-term interest rates continued to stand below the reference value of the respective convergence criterion defined in the European Union Treaty (chart 28). The negative differential between these rates kept widening progressively between June and September 1997, from 1.3 percentage points to 1.6 percentage points. Due to the change in the set of countries recording the best

performance in terms of price stability, this differential stood at 1.3 per cent from November onwards⁽⁸⁾.

Continuing the trend exhibited since April 1995, the Portuguese yield curve shifted downwards in the second half of 1997 (chart 29). Between June and December 1997, the shape of the curve did not change significantly, maintaining its negative slope up to 3-year maturities, remaining positively sloped elsewhere. The spread between 10-year and Lisbor 3-month yields increased by 0.1 percentage points, amounting to 0.6 percentage points.

Completed with information available as at 16 January 1998.

(8) In October, the reference value for long-term interest rates was determined by the rates of Finland, Austria and France. The latter two countries replaced Sweden and Luxembourg.

MONETARY AND CREDIT AGGREGATES

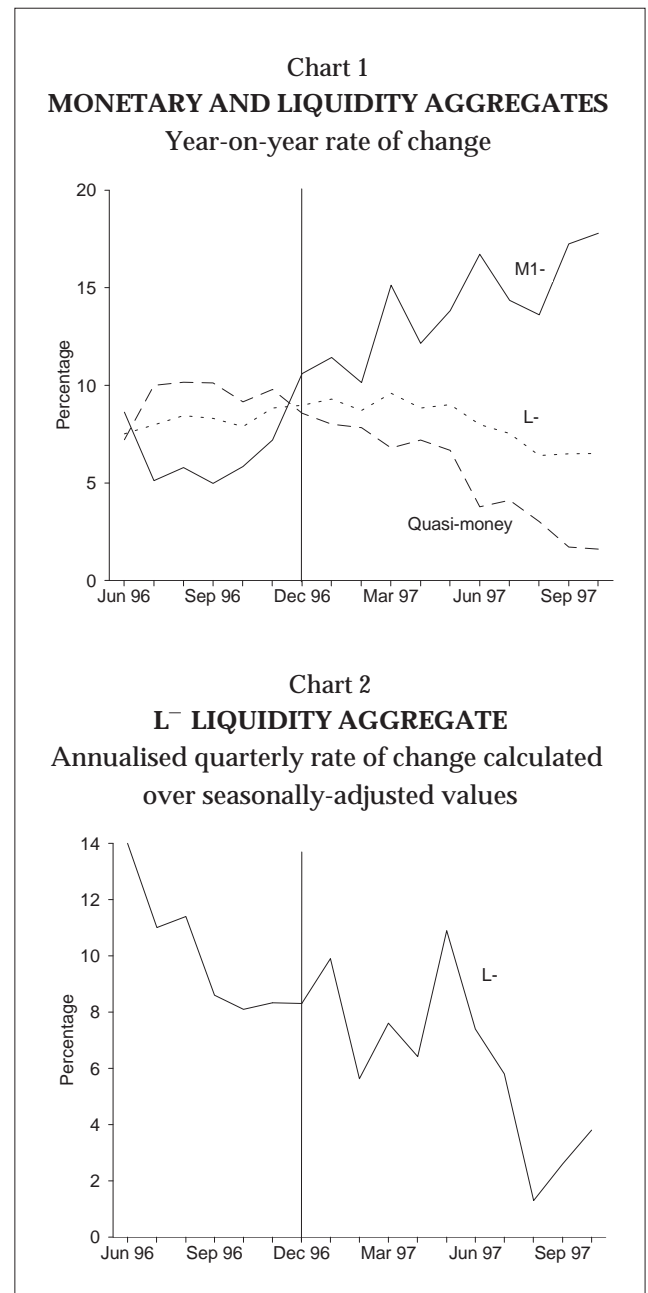
1. MONETARY AGGREGATES

The acceleration trend exhibited by the liquidity aggregate L^- (net assets of the non-financial resident sector) since March 1996 proceeded throughout the first quarter of 1997. From the second quarter onwards, the growth of this aggregate exhibited a slowdown (chart 1). The year-on-year rate of change of the L^- aggregate, calculated over end-of-month balances, stood at 6.5 per cent in October 1997, which compares with 9 per cent in December 1996 and 9.6 per cent in March 1997. The annualised quarterly rate of change⁽¹⁾ of L^- (which is an indicator of the most recent behaviour of this aggregate) decreased from May onwards, standing at 3.8 per cent in October (10.9 per cent in May) (chart 2).

The components of the L^- aggregate ($M1^-$ and quasi-money) exhibited distinct behaviours in the period under review. In fact, $M1^-$ accelerated, while quasi-money recorded a slowdown throughout 1997. The year-on-year rate of growth of $M1^-$ was 17.7 per cent in October, which compares with 15.1 per cent in March 1997 and 10.6 per cent in December 1996. The year-on-year rate of change of quasi-money fell from 8.6 per cent in December 1996 to 1.6 per cent in October 1997.

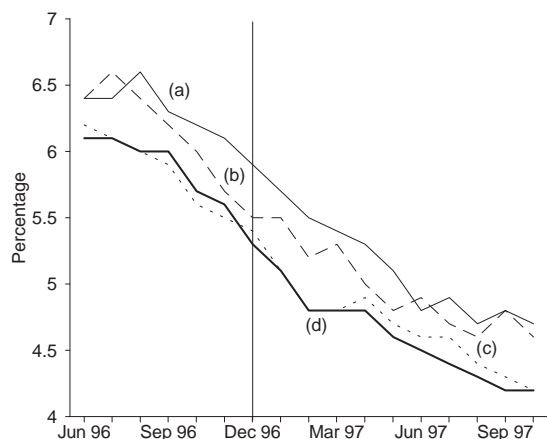
The downward trend of interest rates on time deposits proceeded in 1997 (chart 3), reflecting the disinflation process, in a context of stability of the escudo in the ERM of the EMS. Interest rates for shorter maturities (31 to 90 days) fell from 5.9 per cent in December 1996 to 4.7 per cent in October 1997, i.e. a 1.2 percentage points decline. Longer-term interest rates (over 1 year) fell from 5.3 per cent in December 1996 to 4.2 per cent in October

(1) Calculated on seasonally-adjusted values.



1997. The spread between interest rates for longer (over 1 year) and shorter maturities (31 to 90 days) remained negative throughout the whole period.

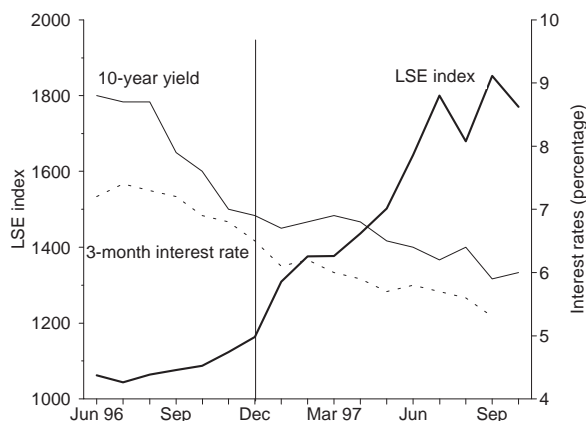
Chart 3
INTEREST RATES ON TIME DEPOSITS



Notes:

- (a) 31 to 90 days.
- (b) 91 to 180 days.
- (c) 181 to 1 year.
- (d) More than 1 year.

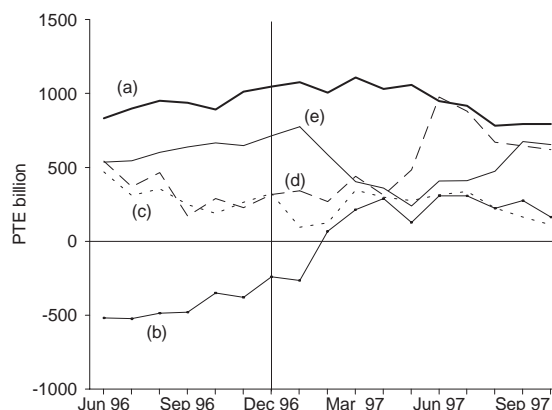
Chart 4
LISBON STOCK EXCHANGE INDEX AND
SHORT- AND LONG-TERM INTEREST RATES
End-of-period values



This behaviour reflects the negative slope of the money market yield curve, and suggests expectations of further decreases in time deposits interest rates for shorter maturities.

The significant growth of the $M1^-$ aggregate (currency and demand deposits) reflects the consolidation of the disinflation process. In fact, the decrease in the inflation rate reduces the opportunity cost of holding cash, leading to a fall in the

Chart 5
FINANCIAL AGGREGATES
Annual flow*

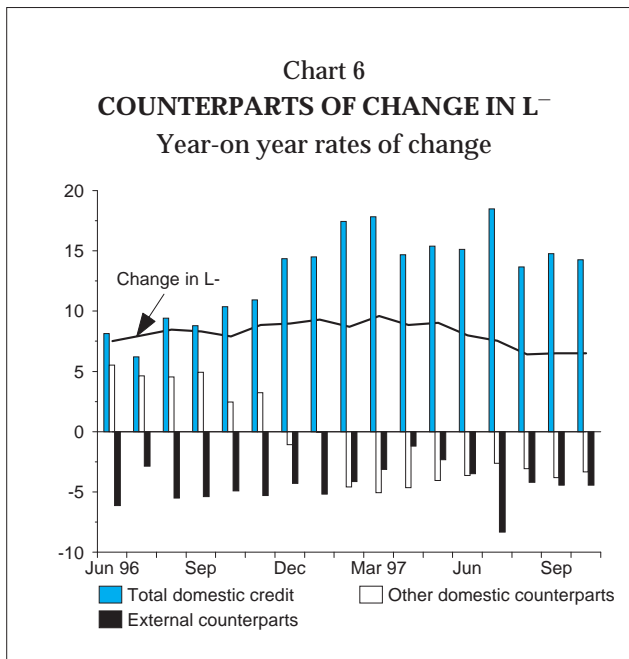


Notes:

- (a) L^- .
 - (b) Investment of other financial intermediaries and financial auxiliary and insurance companies and pension funds in banks and Treasury bills and CLIP.
 - (c) Investment in public debt securities of the non-banking sector.
 - (d) Investment in other domestic securities of the non-banking sector.
 - (e) Investment of the non-banking sector abroad.
- * Calculated on end-of-month balances.

velocity of money. The slowdown exhibited by quasi-money (chiefly constituted of time deposits) is linked to portfolio adjustments. The fall in short-term interest rates made time deposits less attractive than alternative investments such as equity investment (chart 4). This is confirmed by the fact that the slowdown of the liquidity aggregate L^- from the first quarter onwards was accompanied by a greater flow of investment by the non-banking sector, in both domestic securities (namely shares) and external assets (chart 5).

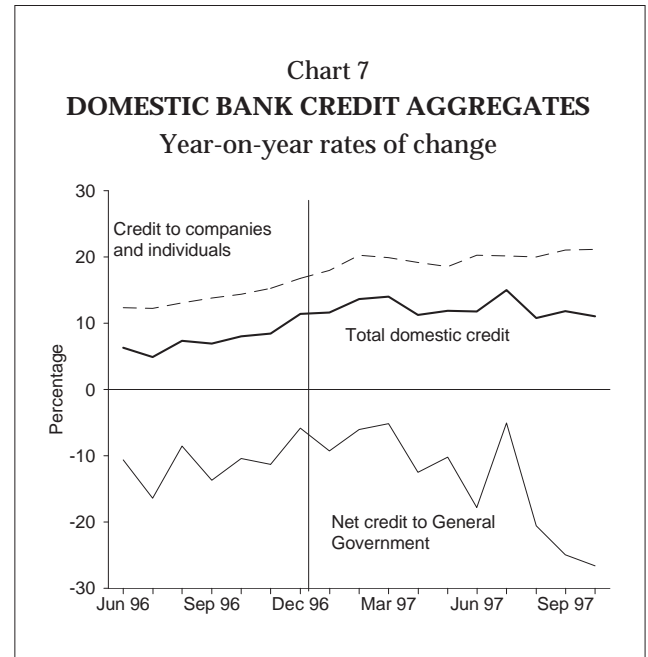
The jagged behaviour of $M1^-$ and quasi-money over the course of the period under analysis — specially the high growth rates of $M1^-$ in June, September and October 1997 — as well as the negative correlation in these months between the rates of growth of the two aggregates, may be related to privatisation operations. In fact, time deposits were substituted by demand deposits, which were then used for the settlement of the purchased securities.



In the period from January to October 1997, money creation reflected the behaviour of total domestic credit. Liquidity creation was due to the increase in credit to companies and individuals since net credit to General Government fell in the period. The foreign counterpart continued to account for a negative contribution to money creation (chart 6).

2. CREDIT AGGREGATES

In October 1997, total domestic credit (TDC) recorded an year-on-year growth rate of 11 per cent, as against 11.4 per cent in December 1996 (chart 7). The behaviour of this aggregate resulted from the fall in net credit to General Government (GG) and from the increase in credit to companies and individuals. Net credit to GG continued recording negative year-on-year growth rates in 1997. This behaviour reflects not only the fall in the borrowing requirement of GG linked to the budgetary consolidation process and to privatisation, but also the greater use made of financing sources other than bank credit. In conformity with the dynamism of investment, and reflecting the continuing fall in interest rates, credit to companies and individuals exhibited high rates of growth and an acceleration throughout 1997. The year-on-year rate of change of this aggregate increased from 16.8 per cent in December 1996 to 21.2 per cent in October 1997.



2.1 Net credit to General Government

Between January and October 1997, General Government borrowing amounted to PTE 150.8 billion, a decrease of PTE 604.1 billion in relation to the same period in the previous year (table 1). In this period, domestic monetary credit to GG decreased by PTE 824.2 billion, reflecting the continuation of the fall in bank credit. Banks disinvested both in Treasury bills (PTE 183.9 billion) and other government securities (PTE 544.9 billion). The GG resorted less to deposits in the Banco de Portugal (PTE 80.3 billion, as against PTE 185.6 billion in the same period in 1996).

In parallel, the General Government resorted more to external credit (PTE 312.4 billion increase, which compares to PTE 188.8 billion in the same period of the previous year). Net sales of domestic debt securities to non-residents also increased, from PTE 235.2 billion between January and October 1996 to PTE 395.1 billion in the same period in 1997.

2.2 Credit to companies and individuals

In the first nine months of 1997, credit to companies and individuals recorded high rates of growth, continuing the acceleration trend started in the second half of 1996. Therefore, this aggregate grew by 21.2 per cent in October 1997, which compares with 16.8 per cent in December 1996 and

Table 1
GENERAL GOVERNMENT BORROWING

PTE billion	1996			1997		
	Year	Jan-Oct	1st half	2nd half	Jan-Oct	1st half
Net domestic credit	124.5	19.1	23.0	101.5	-882.7	-385.2
Monetary	-199.8	-137.0	-91.5	-108.3	-824.2	-488.7
Banking	-189.3	-181.0	-107.1	-82.2	-736.7	-509.7
Banco de Portugal	149.6	185.6	374.7	-225.1	80.3	-40.7
Banks	-338.9	-366.6	-481.8	142.9	-817.0	-469.0
of which:						
Treasury bills ^(a)	7.6	-124.8	-188.8	196.4	-183.9	-88.7
Other investments in public debt securities	-243.8	-132.8	-36.7	-207.1	-544.9	-225.8
T B held by the public ^(a)	-10.5	44	15.6	-26.1	-87.5	21
Non-monetary	324.3	156.1	114.5	209.8	-58.5	103.5
of which:						
Saving certificates (net)	74.3	69.2	38.5	35.8	11.4	9.6
Net foreign credit	189.8	188.8	212.2	-22.4	312.4	219.8
Sales/purchases of domestic debt securities to/from non-residents (net)	259.2	235.2	182.1	77.1	395.1	151.2
Net foreign assets of the Treasury	-16.7	-10.9	-3.9	-12.8	3.2	-11
Adjustment Treasury bills	20.6	21.1	22.2	-1.6	21.2	11.5
Total borrowing	577.4	453.3	435.6	141.8	-150.8	-13.7

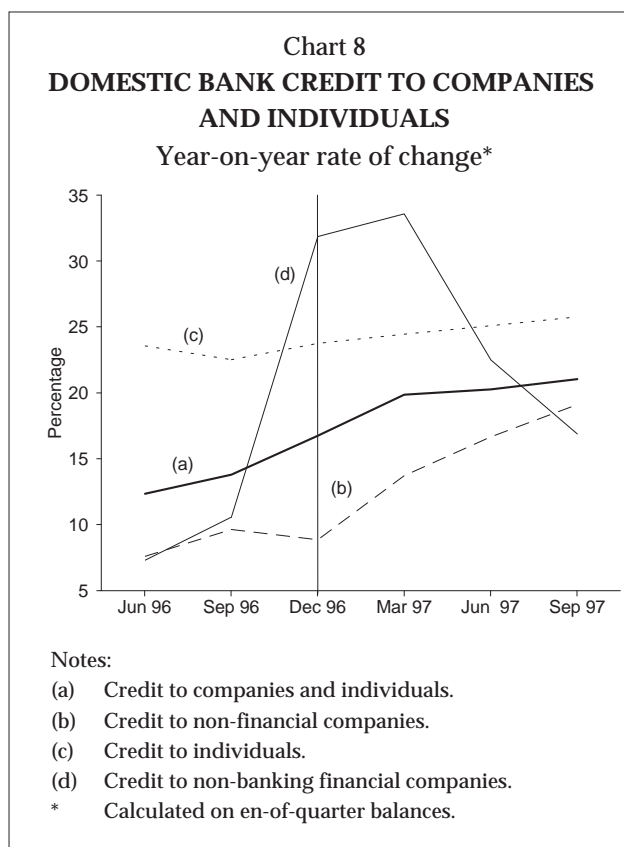
Note:

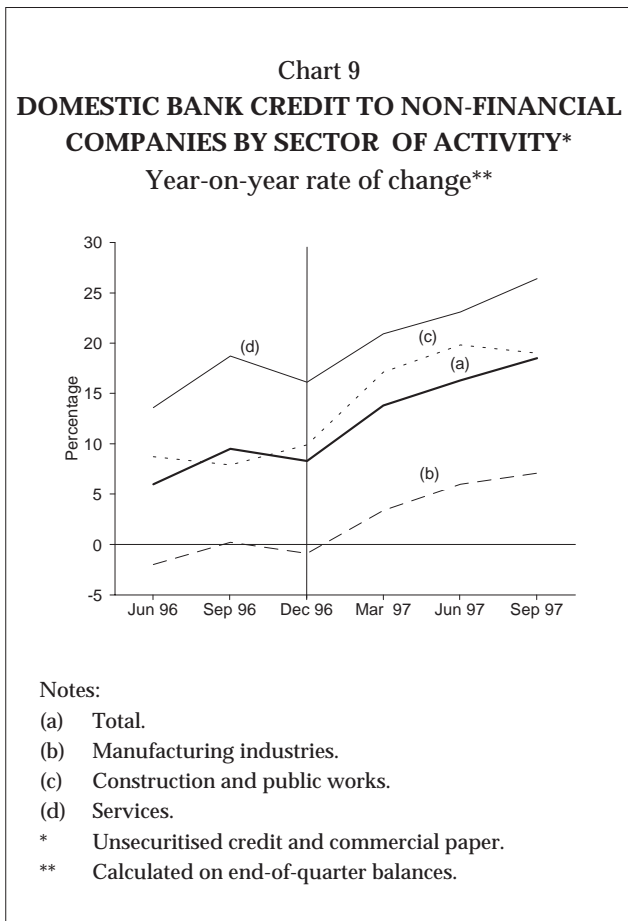
(a) Includes CLIP up to March 1996, the date of redemption of the last tranche.

12.2 per cent in July 1996. This behaviour reflected the acceleration of both credit to non-financial companies and credit to individuals. Credit to non-banking financial companies exhibited a slow-down in the period (chart 8).

Bank lending to non-financial companies accelerated strongly since early 1997; the year-on-year rate of change of bank credit to non-financial companies increased from 8.9 per cent in December 1996 to 19.1 per cent in September 1997. This behaviour is related to the strong growth of investment in 1997. In September 1997, the year-on-year growth of bank lending to non-financial companies for investment purposes amounted to 31.9 per cent, while credit for other purposes increased by 20.1 per cent.

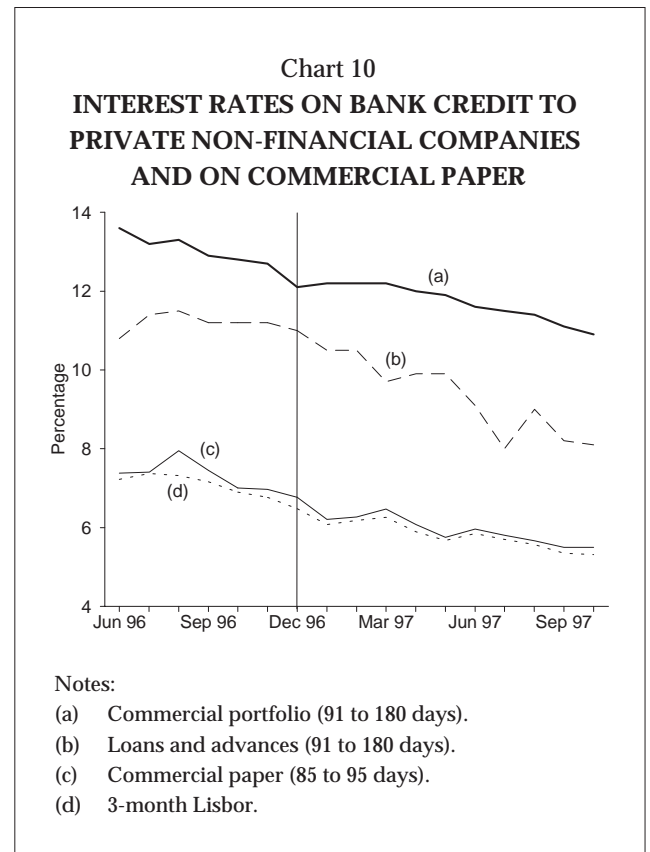
The growth of credit was particularly noticeable in the construction and public works sector and in the services sector (chart 9). The growth of bank lending to the construction and public works sector reached 19.0 per cent in September 1997, which compares with 9.9 per cent in December 1996. The growth of credit to the services sector





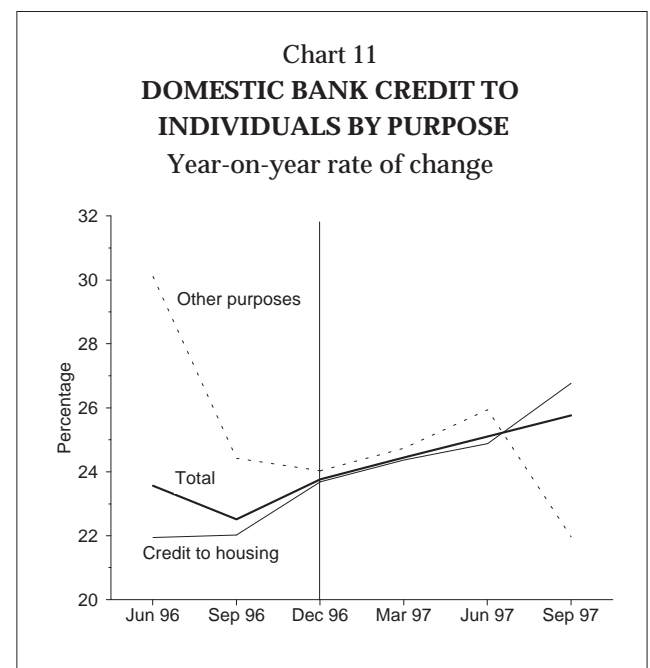
amounted to 26.4 per cent in September 1997 (16.1 per cent in December 1996). Also credit to the manufacturing industry accelerated, from -0.9 per cent in December 1996 to 7.1 per cent in September 1997. It should be noted that these figures may overestimate the growth of credit to the services sector, whilst underestimating the growth of credit to the remaining sectors, since non-financial groups resort increasingly to the credit market through the respective holding companies; these companies are, for statistical reasons, included among the item "other services". Indeed, the year-on-year growth of bank lending to the "other services" sector reached 38.9 per cent in September 1997.

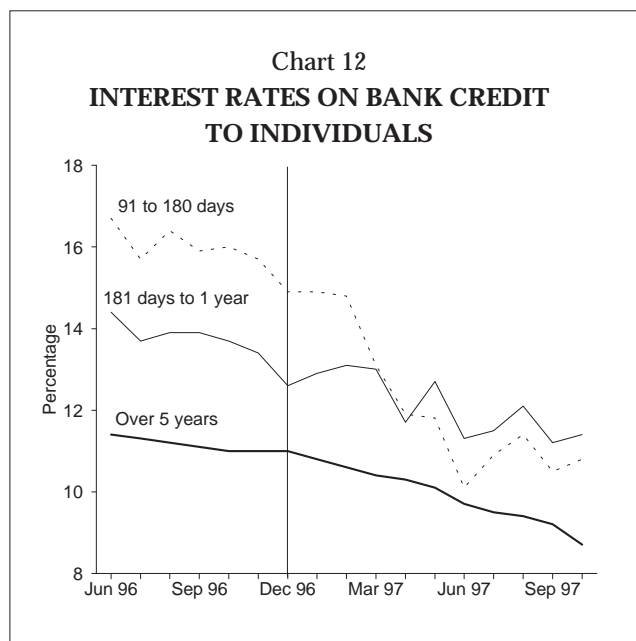
Interest rates on credit to non-financial private companies kept decreasing in 1997, accompanying the behaviour of the interbank money market interest rates (chart 10). In October 1997, the interest rate on loans and advances (91 to 180 days) amounted to 8.1 per cent, 2.9 percentage points below that recorded in December 1996. The commercial portfolio interest rate recorded a less significant decrease (from 12.1 per cent in December



1996 to 10.9 per cent in October 1997). Interest rates on commercial paper (85 to 95 days) fell to 5.5 per cent in October 1997 (6.8 per cent in end 1996).

The acceleration of domestic bank lending to individuals (from 23.8 per cent in December 1996





to 25.8 per cent in September 1997) reflected a stronger growth of credit to housing. The year-on-year rate of change of credit to housing reached

26.8 per cent in September 1997, which compares with 23.7 per cent in December 1996. Credit for other purposes grew by 22 per cent in September 1997 (as against 24 per cent in December 1996). The share of this type of credit in total credit granted to individuals remained virtually unchanged, around 20 per cent.

The growth of domestic lending to individuals has been induced by the downward trend in interest rates. The decline in interest rates was particularly significant in the 91 to 180-day maturity. This rate fell from 14.9 per cent in December 1996, down to 10.8 per cent in October 1997, which corresponds to a 4.1 percentage points decline. In turn, the interest rate over 5 years decreased from 11.0 to 9.2 per cent.

Completed with information available as on 7 December.

UNEMPLOYMENT AND WAGES IN PORTUGAL*

Vitor Gaspar**

Silvia Luz**

1. INTRODUCTION

The recent behaviour of the Portuguese labour market can be described as follows:

- Unemployment reacts predictably and with a lag to fluctuations in economic activity, namely to deviations of output from its trend. The labour market may, therefore, be characterised by a stable Okun relation.
- Nominal wages react significantly to changes in the inflation rate and in the unemployment rate. Wage adjustment is therefore (partial) substitute for adjustment in employment/unemployment, lessening the relevance of the latter.
- Many labour market variables are correlated with the economic cycle, sometimes with a significant lag⁽¹⁾.

The aim of this study, which is related to previous work (namely Marques (1990), Modesto, Monteiro e Neves (1992), Luz and Pinheiro (1993, 1994) and Modesto (1997)⁽²⁾, is to examine some of these stylised facts, namely regarding unemploy-

ment, nominal wages, real wages and productivity and their relationships with the economic cycle. It focuses on the relationship between the unemployment rate and the economic cycle (Okun Law) and between wages and unemployment (Wage Curve).

Our results confirm:

- i) that changes in unemployment are quite sensitive to the economic cycle, which is consistent with the findings in Modesto, Monteiro and Neves (1992) and in Luz and Pinheiro (1993);
- ii) the existence of a long-run relationship between real wages — measured in units of efficiency — and unemployment levels;
- iii) the existence of stable Okun and Wage relationships, which is consistent with a stable natural rate of unemployment for the last 15 years. The estimated natural rate of unemployment stands close to 6 per cent, regardless of the relationship used in its estimation.

The following section presents the model and the estimated Okun equation. Section 3 exhibits the results for the Wage Curve. Lastly, the fourth section makes an appreciation of our findings.

2. THE OKUN LAW: RELATIONSHIP BETWEEN UNEMPLOYMENT RATE AND ECONOMIC CYCLE

In Portugal, evidence indicates a robust relationship between the deviations of output from its trend (the output gap) and deviation of unemploy-

* The opinions of this paper represent the views of the authors, they are not necessarily those of the Banco de Portugal.

The authors would like to thank Olivier Blanchard, Isabel Horta Correia, José Antonio Ferreira Machado, Carlos Robalo Marques and Miguel St. Aubyn for comments on a preliminary version of this paper. The remaining errors are the authors' responsibility.

** Economic Research Department and International Relations Department.

(1) Also the Beveridge curve — which relates waves with unemployment — has remained stable.

(2) The present paper is also related to current researches by Marques and Botas (1997).

ment from its natural rate. Modesto, Monteiro and Neves (1992) and Luz and Pinheiro (1993) estimate and present this relationship as an Okun Law equation.

However, this is not the most current formulation in literature. In fact, text books (e.g., Blanchard (1997)) present the Okun Law as relating changes in the unemployment rate to deviations of GDP growth from its trend growth rate. Deviations of the unemployment rate from the natural unemployment rate are related to deviations of aggregate demand in Modesto, Monteiro and Neves (1992) — which concludes that it is possible to infer a natural rate of unemployment — and to the deviation of GDP from its trend in Luz and Pinheiro (1993).

A NAIRU between 5.5 and 6 per cent was estimated, in the latter study using a long-run cointegration relationship. However, in this formulation, the short-run dynamics (calculated from a representation of the Engle-Granger Theorem) influence the long-run relationship decisively, due to the short sample size (quarterly data running from 1983:2 up to 1992:4).

These results were also corroborated by Modesto (1997), which estimated a natural rate of unemployment around 6 per cent, using a totally different methodology based on panel data (data from 1984 to 1995).

Marques (1990) estimates a 6 per cent natural rate of unemployment in a broad sense⁽³⁾.

We test these findings with more recent data.

The estimation of the relationship between the unemployment rate and the deviation of GDP from its trend leads to:

$$\Delta u_t = 1.52 - 0.254u_{t-1} - 0.142(y - y^p)_{t-4} - 0.076\Delta(y - y^p)_t -$$

(3.87) (-3.95) (3.63) (-2.03)

$$-0.201\Delta(y - y^p)_{t-1} - 0.246\Delta(y - y^p)_{t-2} - 0.135\Delta(y - y^p)_{t-3}$$

(-5.12) (-5.16) (-2.70)

$$R^2 = 0.64 \quad F = 13 \quad SER = 0.192 \quad DW = 1.42$$

(3) The difference between unemployment in a broad sense and in a strict sense stands between 0.5 and 1 percentage points (Labour International Organisation).

where u stands for the unemployment rate, y is GDP in logarithms, y^p is trend GDP in logarithms and Δ is the year-on-year difference (see Appendix for a description of the data). The resulting long-run relationship can be written as follows:

$$u_t = 6.00 - 0.559 (y - y^p)_{t-3}$$

pointing to a natural rate of unemployment close to 6 per cent. For an observed output one per cent above its trend, this relationship yields a 0.56 percentage points decrease in unemployment. Despite some sensitivity of the short-run dynamics to the sample period — with impacts on the persistence of autocorrelation — the long-run relationship is stable even when different formulations for the short-run lag structure are used⁽⁴⁾.

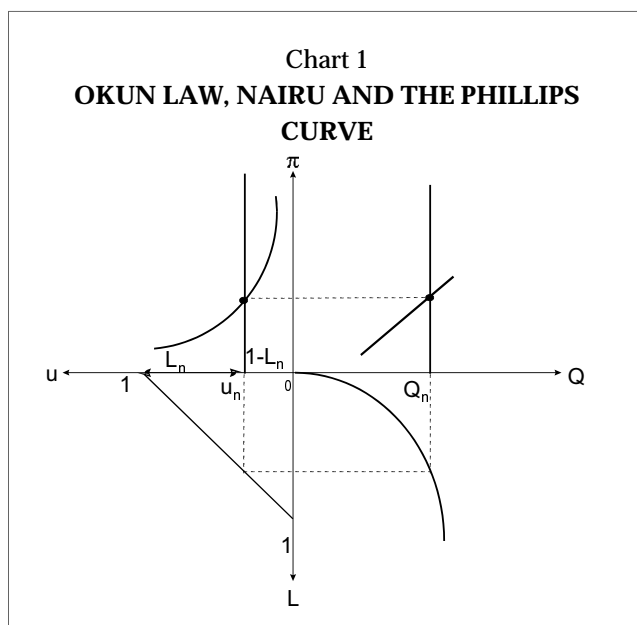
Chart 1 displays a possible interpretation of the Okun relationship. In the first quadrant we have the long-run (vertical) supply for output at its trend level, and short-run supply (positively sloped). Inflation is measured in the vertical axis.

The relationship between output and employment is depicted in the second quadrant; this relationship is obtained from a short-run production function (i.e., assuming a fixed capital stock). Normalising labour supply to equal 1, the unemployment level u is found in the third quadrant (using the -1 slope line), derived from the employment level, L ($u = 1 - L$); finally, the fourth quadrant presents a vertical line standing for the natural rate of unemployment (at level u_n) and a downward line relating unemployment (and employment) and short-run inflation — the short-run Phillips curve. On its turn, this line corresponds to the (constant) short-run supply depicted in the first quadrant⁽⁵⁾.

Chart 1 suggests an interpretation of the Okun Law first suggested by Modesto, Monteiro and Neves (1992): in Portugal, observed unemployment evolves around a stable reference value (the NAIRU) according to the economic cycle.

(4) The regression uses trend GDP as a measure for potential output. Nevertheless, the results are robust to other measures for potential output. Specifically, the results are not changed significantly when the potential output is estimated through a H-P filter.

(5) This presentation follows the pioneer work of Fisher (1926), Phelps (1968) and Friedman (1968).



However, the natural rate of unemployment is not constant, and depends on real factors — including the labour market flexibility and the level of competition in the commodity market⁽⁶⁾. In Portugal, the natural rate of unemployment has remained fairly constant for the last fifteen years⁽⁷⁾.

3. THE WAGE CURVE: RELATIONSHIP BETWEEN REAL WAGES AND UNEMPLOYMENT RATE

The flexibility of real wages is one of the most frequently mentioned characteristics of the Portuguese labour market.

In particular, the real wage reacts strongly and rapidly to the unemployment rate (Modesto, Monteiro and Neves (1992); Luz and Pinheiro (1993)). To evaluate the robustness of this result, the wage

(6) According to Friedman (1968), “Despite the primarily cyclical nature of the current unemployment, part of the job contraction in Portugal has been more persistent in character than in the past, suggesting that structural unemployment might also have increased. Estimates by the European Commission, for instance, point to an increase in the NAIRU of around 0.8 percentage points over the period 1988-1994. Moreover the number of unemployed for more than one year has increased sharply over the last 3 years. By the end of 1996 long term unemployment represented 42.5 per cent of the total unemployment, against 26 per cent in 1992.”

(7) Using a different methodology, Marques and Botas (1997) also concluded for the stability of the natural rate of unemployment.

curve was re-estimated according to the traditional approach, as in Blanchard and Katz (1997) and Blanchflower and Oswald (1994). Hence we have,

$$\Delta w_t = a_0 + \lambda(w-p-f)_{t-4} + a_u u_t + a_w \Delta w_{t-1} + a_p \Delta p_t + \varepsilon_t$$

where w stands for the logarithm of nominal wages, p is the logarithm of the consumer price index, f is the logarithm of the efficiency index⁽⁸⁾ and u stands for the rate of unemployment. Ordinary least squares yield the following results (see Appendix for a description of the data):

$$\Delta w_t = -0.6766 + (-0.158)(w-p-f)_{t-4} + (-3.26) \quad (-3.23)$$

$$+(-0.0045)u_t + 0.60.\Delta w_{t-1} + 0.207\Delta p_t$$

(-2.65) (-3.23) (3.77)

$$R^2 = 0.94 \quad F=183 \quad SER= 0.012 \quad D-h \text{ alt}=-0.56$$

Using the long-run relationship (below) and defining z_w as its residual, the short-run relationship is written as follows:

$$\Delta w_t = -0.0045z_{wt} + 0.60\Delta w_{t-1} + 0.207\Delta p_t$$

Statistical tests do not reject the hypothesis of stability of the parameters, nor the absence of autocorrelation of residuals:

$$AR(1)=5.57, AR(4)=6.25, \text{Chowt}=2.07, \\ CUSUM =0.92, CUSUMSQ=0.375.$$

On its turn, the long-run equation can be written as follows:

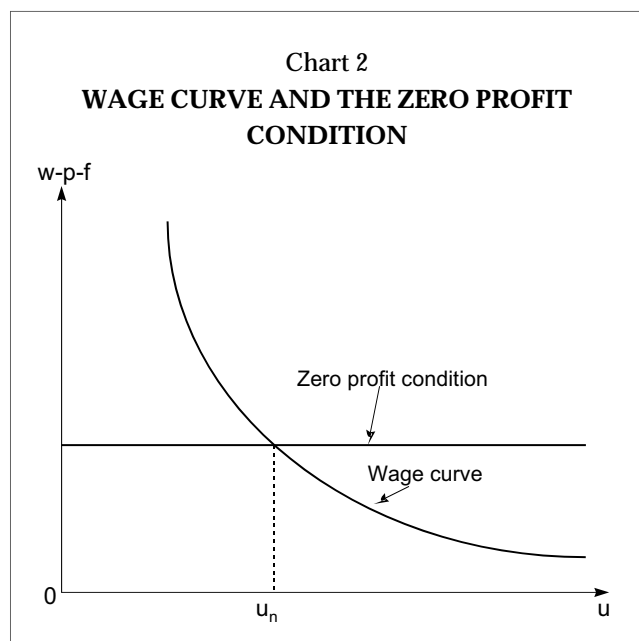
$$u_t = -158.52 - 35.40(w-p-f)$$

which, taking the sample mean real wage as the long-run equilibrium level⁽⁹⁾, yields a natural rate of unemployment of 5.75 per cent — the null profit condition (see chart 2).

The long-run equation yields a -0.16 elasticity of the real wage vis-à-vis the unemployment rate,

(8) The efficiency index is calculated upon the research of Marques and Botas (1997).

(9) This is the only behaviour assumption possible.



which is similar to that presented by Modesto, Monteiro and Neves (1994), -0.14.

It is important to have some intuition concerning the size of this elasticity. Using a completely distinct methodology, Blanchflower and Oswald (1994) estimated a -0.1 average elasticity for a sample including the USA, Great Britain, Canada, Austria, Italy, the Netherlands (with the greatest value in absolute terms, -0.17), Germany and Switzerland. Results suggest a higher elasticity in Portugal than in other industrialised countries.

4. CONCLUSION

Many recent analysis including some by international organisations — such as the European Commission and the OECD — have pointed to the possibility of a structural break in the Portuguese labour market's behaviour, reflecting convergence to the more rigid patterns prevailing in the European Community. As put by the European Commission (1997):

“Despite the primarily cyclical nature of the current unemployment, part of the job contraction in Portugal has been more persistent in character than in the past, suggesting that structural unemployment might also have increased. Estimates by the European Commission, for instance, point to an increase in the NAIRU of around 0.8 percentage

points over the period 1988-1994. Moreover the number of unemployed for more than one year has increased sharply over the last 3 years. By the end of 1996 long term unemployment represented 42.5 per cent of total unemployment, against 26 per cent in 1992.”

The present study estimated the Okun relationships and the wage curve for Portugal; the stability of both relationships for the last 15 years was not rejected. As a result, most fluctuations of unemployment seem to be due to deviations from trend GDP — i.e., fluctuations of unemployment are basically cyclic.

We estimated a natural rate of unemployment from the Okun equation of around 6 per cent, which is low when compared to the average levels recorded in the European Union.

The wage curve leads to a 5.75 per cent NAIRU. Given the constrainty associated to these estimates, this result is identical to the above one.

The real wage elasticity vis-à-vis unemployment (-0.16) is high according to the international standards. This is a significant result, and is consistent with the findings of Modesto, Monteiro and Neves (1992) and Luz and Pinheiro (1993, 1994), for periods of high (two-digit) inflation and comprising only one recession moment (1983-1984).

Results could always be seen as depending on the macroeconomic regime in force, which was characterised by high inflation and the utilisation of the exchange rate as an adjustment instrument.

The widening of the sample period up to 1996 shows that wage flexibility holds even in a context of low inflation and exchange rate stability.

This finding is very important as regards the Portuguese participation in the euro area⁽¹⁰⁾. In fact, the real flexibility of wages is a substitute to the international mobility of labour force, a crucial element in adjusting for idiosyncratic shocks. In short, real flexibility of wages grants to the Portuguese economy an additional ability to adjust for possible unfavourable circumstances.

(10) See, for example, Buti and Sapir (1997) for a review on this issue.

APPENDIX**The data**

This study uses quarterly data for the period running from 1983 up to 1996 for the following variables: unemployment rate (u), output (y), prices (p), wages (w) and productivity (f).

The original sources are the INE and the Banco de Portugal; the statistical treatment, the adjustment of trend and seasonality, and the linkage of series follow procedures previously used in former studies, so these are described briefly here.

The rate of unemployment (u): this variable is obtained by adjusting the unemployment series of the "Inquérito ao Emprego" of the INE for seasonality. Since methodological changes were introduced in 1992 in this survey, the series were linked by using the data on the previous year situation there included.

Output gap ($y - y^p$): deviation of the logarithm of GDP (Quarterly accounts) from its trend (y^p , potential output).

Wages (w): logarithm of an index (1991 = 100) equalling the real growth of total wage earners' wages (calculated by the Banco de Portugal) times the quarterly data of those wages as disclosed in the Historical Series for the Portuguese Economy.

Prices (p): logarithm of total CPI excluding rents (1991 = 100).

Efficiency (f): index (1991 = 100) built from the productivity measure presented in Marques and Botas (1997).

Symbol " Δx " denotes the year-on-year change rate of variable " x ".

REFERENCES

- Blanchard, O., 1997, *Macroeconomics*, Prentice-Hall.
- Blanchard, O. and L. Katz, 1997, "What we know and do not know about the natural rate of unemployment", *Journal of Economic Perspectives*, 11, pp 51-72.
- Buti, M. and A. Sapir, 1997, Economic Policy in EMU, Discussion Paper 124, November.
- European Commission, 1997, *The Economic and Financial Situation in Portugal in the Transition to EMU*.
- Fisher, I., 1926, "A Statistical Relation between Unemployment and Price Changes", *International Labour Review*, vol. XIII, 6, June, pp. 47-56.
- Friedman, M. 1968, "The Role of Monetary Policy", *American Economic Review*, April, 58, 1-21.
- Luz, S. and M. Pinheiro, 1993, "Desemprego, Vagas e Crescimento salarial" *Boletim Trimestral do Banco de Portugal*, June, pp. 41-51.
- Luz, S. and M. Pinheiro, 1994, "Wage Rigidity and Job Mismatch in Europe: Some Evidence", *Working Paper*, nº 2, Banco de Portugal.
- Marques, C., 1990, "Produto potencial, Desemprego e Inflação em Portugal", *Working Paper*, nº1, Banco de Portugal
- Marques, C. and S. Botas, 1997, "Estimation of the NAIRU for the Portuguese Economy", *Working Paper* nº 6, Banco de Portugal, Dezembro.
- Modesto, L., M. Monteiro and J.C. das Neves, 1992, "Some Aspects of the Portuguese Labour Market 1977-1988: Neutrality, Hysteresis and the Wage Gap", in Amaral, J.F. *et al.* (eds.), *The Portuguese Economy Towards 1992*, Kluwer Academic Publishers.
- Modesto, L., 1977, "Measuring Job Mismatch and Structural Unemployment in Portugal: an Empirical Study Using Panel Data", *DGEP Working Paper* nº 1.
- Phelps, E., 1968, "Money-Wage Dynamics and Labour Market Equilibrium", *Journal of Political Economy*, July-August, 76, Part 2, pp. 678-711.
- Phelps, E., 1994, *Structural Slumps*, Harvard University Press.
- Pinheiro, M. *et al.*, 1997, "Historical Series for the Portuguese Economy".

**EXTRACTING INFORMATION FROM OPTIONS PREMIA:
THE CASE OF THE RETURN OF THE ITALIAN LIRA TO THE ERM OF THE EMS***

*Bernardino Adão***

*Nuno Cassola***

*Jorge Barros Luís***

1. INTRODUCTION

The prices of financial derivatives (forward contracts, futures and options) reflect, at each moment, the expectations of economic agents regarding the future path of the prices of the underlying assets. On the other hand, the price of the underlying assets (e.g., Treasury bills, Treasury bonds, stocks and commodities) reflect market expectations of the future path of their economic determinants. While forward and futures contracts provide information on the expected value of the prices of the underlying assets, options premia allow the estimation of the risk-neutral probability density function (PDF) of the prices of the underlying assets.

In this context, the prices of financial derivatives contain potentially useful information for monetary authorities, namely in building indicators for monetary conditions, in assessing the impact of monetary policy actions, and to help detect anomalies in the functioning of the financial markets. These issues have been studied by several authors and central banks (see for instance Abken (1995), Bahra (1996), Deutsche Bundesbank (1995) and Söderlind and Svenson (1996)). Naturally, this information is also relevant from the viewpoint of

portfolio and risk management by the private sector, and by financial institutions in particular.

The comparison between the PDF of the price of a financial asset, estimated at different instants for a given maturity, provides a measure for the path of market expectations, and for its dispersion. For instance, Campa, Chang and Reider (1997) analyse the reaction of foreign exchange markets to the re-entrance of the Italian lira in the Exchange Rate Mechanism of the European Monetary System (ERM-EMS) on 25 November 1996, and find that the implicit exchange rate volatility of the Italian lira decreased with its re-entrance in the ERM-EMS. This finding is consistent with the idea that the change in the exchange rate regime aimed at stabilising the exchange rate.

This study analyses the same episode, but using the premia of futures options of the 3-month interest rates of the Italian euro-lira⁽¹⁾. We use daily observations of the settlement prices for the call-options and put-options traded in the London International Financial Futures Exchange (LIFFE).

The remainder of the paper is structured as follows: section 2 presents the most essential aspects of the estimation methodology; all technical details are left for Appendix. The third section applies the methodology and the last one concludes.

* The opinions of this paper represent the views of the authors, they are not necessarily those of the Banco de Portugal. The authors benefited from the generosity of LIFFE concerning the statistical data, and thank Vitor Gaspar and José Ferreira Machado for their comments. The authors are liable for remaining errors and omissions. This research also benefited from the visit of Charles Thomas to the Banco de Portugal.

** Economic Research Department.

(1) The analysis of Campa, Chang and Reider (1997) is exclusively based on the premia of over-the-counter currency options, with no reference to interest rates.

2. MAIN CONCEPTS AND ESTIMATION
METHODOLOGY

As a rule, financial institutions price European options with the Black-Scholes formula⁽³⁾. The main assumption underlying to the Black-Scholes model is that the rates of return have normal distribution (hence the prices of the underlying assets are log-normally distributed) and are independent and identically distributed. The problem is that the assumption of log-normality of the prices of the underlying assets is frequently in contradiction with reality.

For instance, this model considers that the implied volatility is constant for all strike prices and for all expiration dates, which regularly does not apply. In fact, for the same expiration date and underlying asset, the volatility is a convex function of the strike price, assuming higher values for the options with strike prices more distant to the expected future price of the underlying asset. The relation between implied volatility and the strike price is currently defined as volatility smile, being usually considered as a signal of rejection of the log-normality assumption.

Consider the valuation of an European call-option with expiration date T . Let S_t be the price of the underlying asset in moment T , and X the strike price of the European option. The premium at t of a call-option with term to maturity equalling $\tau = T - t$, $C(X, \tau)$, is the expected return of the option, discounting that return if the premium is paid up-front at date t . This corresponds to:

$$C(X, \tau) = e^{-r_t \cdot \tau} \int_0^{\infty} \max[S_T - X, 0] q_t(S_T) dS_T \quad (1)$$

where r_t, τ is the relevant interest rate at the moment t (for maturity τ) and $q_t(S_T)$ is the (risk-neutral) PDF of the asset price S_T , conditional on the current asset price S_t .

In principle, the PDF can be assessed directly through a discrete approximation from the option premia for the different strike prices observed, since theoretically the risk-neutral PDF corresponds to the second derivative of the call-option price function⁽⁴⁾:

$$q_t(S_T) = e^{r_t \cdot \tau} \cdot \frac{\partial^2 C(X, \tau)}{\partial X^2} \quad (2)$$

However, the results obtained through this method are in general unsatisfactory⁽⁵⁾. Many alternative techniques for estimating the PDF from the option premia have been suggested⁽⁶⁾. One of the most currently used consists of estimating the parameters of a combination of two log-normal distributions:

$$q_t(S_T) = \theta L(\alpha_1, \beta_1; S_T) + (1 - \theta) L(\alpha_2, \beta_2; S_T) \quad (3)$$

where $L(\alpha_1, \beta_1; S_T)$ and $L(\alpha_2, \beta_2; S_T)$ are lognormal distributions, α_1 and α_2 are the means of the respective normal distributions, β_1 and β_2 are the standard deviations of the respective normal distributions and θ is the weight of the first distribution⁽⁷⁾.

3. THE RETURN OF THE ITALIAN LIRA TO THE ERM-EMS

The impact of the return of the Italian lira to the ERM-EMS on the expected exchange rate was analysed in Campa, Chang and Reider (1997). Here we analyse the impact of this episode on the expected value of short-term interest rates. We use a daily sample of settlement prices of futures options expiring on 18 December 1996, for the various strike prices, throughout the whole period these were traded (from 19 March up to 16 December 1996).

Estimating the parameters of equation (3) yields the PDF that characterise the daily path of the expected 3-month interest rate of the Italian lira for 18 December 1996. Since the expiration date is fixed, one may observe that the variance of the distribution naturally decreases with the approximation of the expiration date. For instance, if the price of the underlying asset follows a log-normal distribution, when t increases a fraction of time (e.g.) one day, with time expressed in years)

(3) The Black-Scholes pricing formula was developed in Black and Scholes (1973), for premia of options on non-dividend-paying stocks. Thereafter, this formula was adapted to options on financial assets with different features.

(4) See Appendix for a derivation of the result.

(5) See for instance Soderlind and Svenson (1996).

(6) See for instance Adão *et al.* (1997) and Bahra (1997) on the methods of estimating PDF from option premia.

(7) The estimates for the parameters are obtained solving the optimisation problem presented in Appendix.

the standard deviation of $\ln S_t$ decreases by $\sigma(\sqrt{\tau} - \sqrt{\tau - 1/365})$. Therefore, if the comparison is made between quite close days, this correction is irrelevant. However, for comparisons between days reasonably far away, any conclusions on the expectations' dispersion in different moments require the correction of the standard-deviation of $\ln S_t$ by the "time" effect. This same correction principle was used for the estimated distributions.

Chart 1 displays the PDF adjusted for the "time" effect estimated for three distinct dates: 19 March, 19 November and 25 November, respectively, the date of the beginning of trade on options expiring on 18 December 1996, one week before and the day the Italian lira returned to the ERM-EMS.

The means of the distributions equalled 8.8, 7.1 and 7.06 per cent, respectively. It should be noted that the mean of the distribution did not change significantly with the return of the lira to the ERM-EMS. Nevertheless, the probability associated to higher interest rates decreases — i.e., the skewness of the distribution decreases.

A significant reduction in the distribution's mean occurred after with the legislative election which took place on 21 April 1996, as shown in chart 2. Indeed, on 17 April the distribution mean amounted to 8.6 per cent, while on 22 April the mean stood at 7.5 per cent. Contrary to what occurred with the return of the Italian lira to the ERM-EMS, no significant changes in the skewness of the PDF were recorded.

4. CONCLUSIONS

Financial derivatives provide relevant information of the expectations of economic agents regarding the futures path of prices of the underlying assets. While the prices of futures contracts deliver indications on the expected values, the prices of options allow for a more complete characterisation of the various future values.

Taking the 3-month Italian lira interest rate from futures options premia traded at LIFFE, we estimated the risk-neutral PDF of the 3-month Italian lira interest rate. We found that the return of the Italian lira to the ERM-EMS did not change sig-

Chart 1
PROBABILITY DENSITY FUNCTIONS OF THE
THREE-MONTH ITALIAN LIRA INTEREST RATE

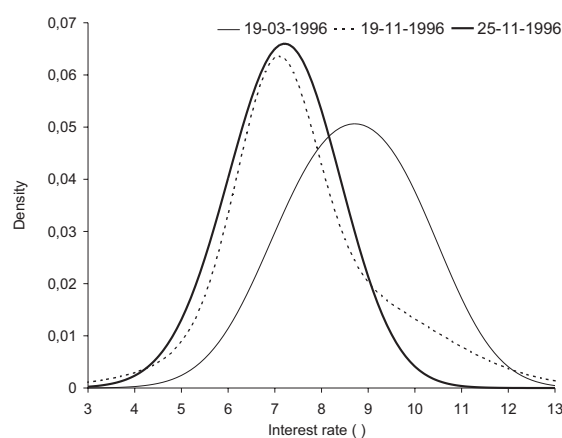
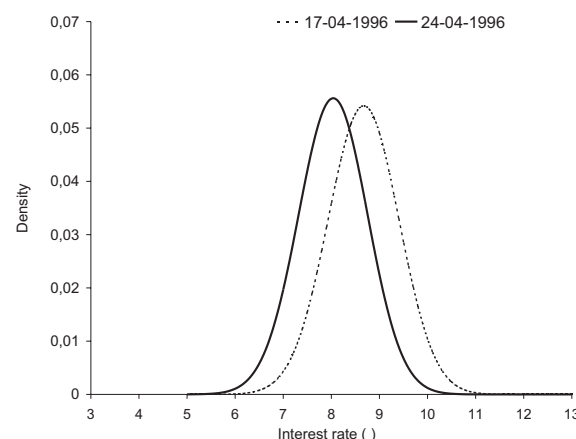


Chart 2
PROBABILITY DENSITY FUNCTIONS OF THE
THREE-MONTH ITALIAN LIRA INTEREST RATE



nificantly the expected short-term interest rates, despite reducing the skewness of the probability distribution. On the contrary, the results of the Italian legislative elections led to a significant shift of the distribution, thereafter characterised by a lower expected short-term interest rate. The electoral results resulted in a lessening of political uncertainty in Italy, and may have consolidated the expectations regarding the return of the Italian lira to the ERM-EMS. Therefore, when the return of the lira to the ERM took place, this uncertainty had already been discounted by the markets.

REFERENCES

- Abken, Peter A. (1995) — “Using Eurodollar Futures and Options: Gauging the Market’s View of Interest Rate Movements”, *Federal Reserve Bank of Atlanta Economic Review*, March/ /April:10-30.
- Adão, Bernardino, Nuno Cassola and Jorge Barros Luís (1997) — “Methods of extracting information from the premia of options on financial assets”, Banco de Portugal, DEE, *mimeo* (in Portuguese).
- Bahra, Bhupinder (1997) — “Implied Risk-Neutral Probability Density Functions from Option Prices: Theory and Application”, *Bank of England Working Paper*, no. 66.
- Bahra, Bhupinder (1996) — “Implied Risk-Neutral Probability Density Functions from Option Prices: Theory and Application”, *Bank of England Economic Bulletin*, August 1996.
- Bates, David S. (1995), “Post-’87 Crash Fears in S&P 500 Futures Options”, *NBER Working Paper Series*, W.P. 5894.
- Black, Fischer and Myron Scholes (1973) — “The Pricing of Options and Corporate Liabilities”, *Journal of Political Economy*, 81 (May-June), pp. 637-654.
- Campa, José Manuel, P. H. Kevin Chang and Robert L. Reider (1997), “ERM bandwidths for EMU and after: evidence from foreign exchange options”, *Economic Policy*, No. 24, Abril, pp. 55-89.
- Deutsche Bundesbank (1995), “The information content of derivatives for monetary policy”, *Deutsche Bundesbank Monthly Report*, November 1995.
- Duffie, Darrell (1989), *Futures Markets*, Prentice-Hall.
- Hull, John (1997), *Options, Futures, and Other Derivatives* (Third Edition), Prentice-Hall.
- Melick, Will and Charles Thomas (1994), “Recovering an Asset’s Implied PDF from Option Prices: An Application to Crude Oil During the Gulf Crises”, *Working Paper*, Federal Reserve Board, Washington.
- Söderlind, Paul and Lars E.O. Svensson (1997), “New Techniques to Extract Market Expectations from Financial Instruments”, *NBER Working Paper* 5877.

APPENDIX

Deduction of equation (2)

Differentiating (1) in order to the strike price we obtain:

$$\begin{aligned} \frac{\partial C(X, \tau)}{\partial X} &= -e^{-r_i, \tau} \int_X^\infty q_t(S_T) dS_T = \\ &= -e^{-r_i, \tau} \left(1 - \int_{-\infty}^X q_t(S_T) dS_T \right) \end{aligned} \tag{A1}$$

which yields,

$$1 + \frac{\partial C(X, \tau)}{\partial X} e^{r_i, \tau} = P_q[S_T \leq X] \tag{A2}$$

where P_q is the probability measure.

Differentiating (A2) in order to the strike price yields (2).

Estimation of the parameters of equation (3)

The parameters are estimated from the minimisation of a distance function between the sample premia and the premia obtained from the specified functional form. The following optimisation problem is solved:

$$\begin{aligned} \underset{\alpha_1, \alpha_2, \beta_1, \beta_2, \theta}{\text{Min}} \sum_{i=1}^N [C(X_i, \tau) - C_i^0]^2 + \sum_{i=1}^N [P(X_i, \tau) - P_i^0]^2 + \\ \left[+\theta e^{\alpha_1 + \frac{1}{2}\beta_1^2} + (1-\theta)e^{\alpha_2 + \frac{1}{2}\beta_2^2} - e^{r\tau} S \right]^2 \end{aligned} \tag{A3}$$

subject to $\beta_1, \beta_2 > 0$ and $0 \leq \theta \leq 1$, and being:

$$C(X_i, \tau) = e^{-r\tau} \int_{X_i}^\infty [\theta L(\alpha_1, \beta_1; S_T) + \tag{A4}$$

$$+(1-\theta)L(\alpha_2, \beta_2; S_T)](S_T - X_i) dS_T$$

$$\begin{aligned} P(X_i, \tau) = e^{-r\tau} \int_0^{X_i} [\theta L(\alpha_1, \beta_1; S_T) + \\ +(1-\theta)L(\alpha_2, \beta_2; S_T)](X_i - S_T) dS \end{aligned} \tag{A5}$$

where X_i ($i = 1, \dots, N$) are the strike prices and $P(X, \tau)$ is the price of a put-option.

The first two terms in (A3) are the sum of square of the residuals between the estimated and the sample premia of call-options and put-options, respectively. The last term is an approximating factor of the estimated mean to the forward price.

This method has several advantages: firstly, it allows for flexible density functions, consequently permitting to characterise multimodal functions and functions exhibiting skewness or kurtosis; secondly, it allows to use simultaneously call-options and put-options premia, without any arithmetic transformation. However, it is a time-consuming procedure and the results are sensitive to the initial values.

To minimise these aspects, one may use a more comprehensive function, for instance, minimising only on call-options premia (and/ or transforming the Put-options premia into call-options premia) and eliminating the approximating factor to the forward. The elimination of this factor allows to use the deviations between the estimated mean and the forward price as a measure of the degree of precision of the distribution obtained.

ESTUDOS E DOCUMENTOS DE TRABALHO / WORKING PAPERS

- 1/90** PRODUTO POTENCIAL, DESEMPREGO E INFLAÇÃO EM PORTUGAL
Um estudo para o período 1974-1989
— Carlos Robalo Marques
- 2/90** INFLAÇÃO EM PORTUGAL
Um estudo econométrico para o período 1965-1989, com projecções para 1990 e 1991
— Carlos Robalo Marques
- 3/92** THE EFFECTS OF LIQUIDITY CONSTRAINTS ON CONSUMPTION BEHAVIOUR
The Portuguese Experience
— Sílvia Luz
- 4/92** LOW FREQUENCY FILTERING AND REAL BUSINESS CYCLES
— Robert G. King, Sérgio T. Rebelo
- 5/92** GROWTH IN OPEN ECONOMIES
— Sérgio Rebelo
- 6/92** DYNAMIC OPTIMAL TAXATION IN SMALL OPEN ECONOMIES
— Isabel H. Correia
- 7/92** EXTERNAL DEBT AND ECONOMIC GROWTH
— Isabel H. Correia
- 8/92** BUSINESS CYCLES FROM 1850 TO 1950: NEW FACTS ABOUT OLD DATA
— Isabel H. Correia, João L. Neves, Sérgio Rebelo
- 9/92** LABOUR HOARDING AND THE BUSINESS CYCLE
— Craig Burnside, Martin Eichenbaum, Sérgio Rebelo
- 10/92** ANALYSIS OF FOREIGN DIRECT INVESTMENT FLOWS IN PORTUGAL USING PANEL DATA
— Luísa Farinha
- 11/92** INFLATION IN FIXED EXCHANGE RATE REGIMES:
THE RECENT PORTUGUESE EXPERIENCE
— Sérgio Rebelo
- 12/92** TERM STRUCTURE OF INTEREST RATES IN PORTUGAL
— Armindo Escalda
- 13/92** AUCTIONING INCENTIVE CONTRACTS: THE COMMON COST CASE
— Fernando Branco
- 14/92** INDEXED DEBT AND PRODUCTION EFFICIENCY
— António S. Mello, John Parsons
- 15/92** “TESTING ” FOR MEAN AND VARIANCE BREAKS WITH DEPENDENT DATA
— José A. F. Machado
- 16/92** COINTEGRATION AND DYNAMIC SPECIFICATION
— Carlos Robalo Marques

- 17/92** FIRM GROWTH DURING INFANCY
— José Mata
- 18/92** THE DISTRIBUTION OF HOUSEHOLD INCOME AND EXPENDITURE IN PORTUGAL: 1980 and 1990
— Miguel Gouveia, José Tavares
- 19/92** THE DESIGN OF MULTIDIMENSIONAL AUCTIONS
— Fernando Branco
- 20/92** MARGINAL INCOME TAX RATES AND ECONOMIC GROWTH IN DEVELOPING COUNTRIES
— Sérgio Rebelo, William Easterly
- 21/92** THE EFFECT OF DEMAND AND TECHNOLOGICAL CONDITIONS ON THE LIFE EXPECTANCY OF NEW FIRMS
— José Mata, Pedro Portugal
- 22/92** TRANSITIONAL DYNAMICS AND ECONOMIC GROWTH IN THE NEOCLASSICAL MODEL
— Robert G. King, Sérgio Rebelo
- 23/92** AN INTEGRATED MODEL OF MULTINATIONAL FLEXIBILITY AND FINANCIAL HEDGING
— António S. Mello, Alexander J. Triantis
- 24/92** CHOOSING AN AGGREGATE FOR MONETARY POLICY: A COINTEGRATION APPROACH
— Carlos Robalo Marques, Margarida Catalão Lopes
- 25/92** INVESTMENT: CREDIT CONSTRAINTS, REGULATED INTEREST RATES AND EXPECTATIONS OF FINANCIAL LIBERALIZATION – THE PORTUGUESE EXPERIENCE
— Koleman Strumpf
- 1/93** SUNK COSTS AND THE DYNAMICS OF ENTRY
— José Mata
- 2/93** POLICY, TECHNOLOGY ADOPTION AND GROWTH
— William Easterly, Robert King, Ross Levine, Sérgio Rebelo
- 3/93** OPTIMAL AUCTIONS OF A DIVISIBLE GOOD
— Fernando Branco
- 4/93** EXCHANGE RATE EXPECTATIONS IN INTERNATIONAL OLIGOLOGY
— Luís Cabral, António S. Mello
- 5/93** A MODEL OF BRANCHING WITH AN APPLICATION TO PORTUGUESE BANKING
— Luís Cabral, W. Robert Majure
- 6/93** HOW DOES NEW FIRM SURVIVAL VARY ACROSS INDUSTRIES AND TIME?
— José Mata, Pedro Portugal
- 7/93** DO NOISE TRADERS “CREATE THEIR OWN SPACE”?
— Ravi Bhushan, David P. Brown, António S. Mello
- 8/93** MARKET POWER MEASUREMENT – AN APPLICATION TO THE PORTUGUESE CREDIT MARKET
— Margarida Catalão Lopes
- 9/93** CURRENCY SUBSTITUTABILITY AS A SOURCE OF INFLATION DISCIPLINE
— Pedro Teles

- 10/93** BUDGET IMPLICATIONS OF MONETARY COORDINATION IN THE EUROPEAN COMMUNITY
— Pedro Teles
- 11/93** THE DETERMINANTS OF FIRM START-UP SIZE
— José Mata
- 12/93** FIRM START-UP SIZE: A CONDITIONAL QUANTILE APPROACH
— José Mata, José A. F. Machado
- 13/93** FISCAL POLICY AND ECONOMIC GROWTH: AN EMPIRICAL INVESTIGATION
— William Easterly, Sérgio Rebelo
- 14/93** BETA ESTIMATION IN THE PORTUGUESE THIN STOCK MARKET
— Armindo Escalda
- 15/93** SHOULD CAPITAL INCOME BE TAXED IN THE STEADY STATE?
— Isabel H. Correia
- 16/93** BUSINESS CYCLES IN A SMALL OPEN ECONOMY
— Isabel H. Correia, João C. Neves, Sérgio Rebelo
- 17/93** OPTIMAL TAXATION AND CAPITAL MOBILITY
— Isabel H. Correia
- 18/93** A COMPOSITE COINCIDENT INDICATOR FOR THE PORTUGUESE ECONOMY
— Francisco Craveiro Dias
- 19/93** PORTUGUESE PRICES BEFORE 1947: INCONSISTENCY BETWEEN THE OBSERVED COST OF LIVING INDEX AND THE GDP PRICE ESTIMATION OF NUNES, MATA AND VALÉRIO (1989)
— Paulo Soares Esteves
- 20/93** EVOLUTION OF PORTUGUESE EXPORT MARKET SHARES (1981-91)
— Cristina Manteu, Ildeberta Abreu
- 1/94** PROCUREMENT FAVORITISM AND TECHNOLOGY ADOPTION
— Fernando Branco
- 2/94** WAGE RIGIDITY AND JOB MISMATCH IN EUROPE: SOME EVIDENCE
— Sílvia Luz, Maximiano Pinheiro
- 3/94** A CORRECTION OF THE CURRENT CONSUMPTION INDICATOR – AN APPLICATION OF THE INTERVENTION ANALYSIS APPROACH
— Renata Mesquita
- 4/94** PORTUGUESE GDP AND ITS DEFLATOR BEFORE 1947: A REVISION OF THE DATA PRODUCED BY NUNES, MATA AND VALÉRIO (1989)
— Carlos Robalo Marques, Paulo Soares Esteves
- 5/94** CCCHANGE RATE RISK IN THE EMS AFTER THE WIDENING OF THE BANDS IN AUGUST 1993
— Joaquim Pires Pina
- 6/94** FINANCIAL CONSTRAINTS AND FIRM POST-ENTRY PERFORMANCE
— Paulo Brito, António S. Mello
- 7/94** STRUCTURAL VAR ESTIMATION WITH EXOGENEITY RESTRICTIONS
— Francisco C. Dias, José A. F. Machado, Maximiano R. Pinheiro

- 8/94 TREASURY BILL AUCTIONS WITH UNINFORMED BIDDERS
— Fernando Branco
- 9/94 AUCTIONS OF SHARES WITH A SECONDARY MARKET AND TENDER OFFERS
— António S. Mello, John E. Parsons
- 10/94 MONEY AS AN INTERMEDIATE GOOD AND THE WELFARE COST OF THE INFLATION TAX
— Isabel Correia, Pedro Teles
- 11/94 THE STABILITY OF PORTUGUESE RISK MEASURES
— Armindo Escalda
- 1/95 THE SURVIVAL OF NEW PLANTS: START-UP CONDITIONS AND POST-ENTRY EVOLUTION
— José Mata, Pedro Portugal, Paulo Guimarães
- 2/95 MULTI-OBJECT AUCTIONS: ON THE USE OF COMBINATIONAL BIDS
— Fernando Branco
- 3/95 AN INDEX OF LEADING INDICATORS FOR THE PORTUGUESE ECONOMY
— Francisco Ferreira Gomes
- 4/95 IS THE FRIEDMAN RULE OPTIMAL WHEN MONEY IS AN INTERMEDIATE GOOD?
— Isabel Correia, Pedro Teles
- 5/95 HOW DO NEW FIRM STARTS VARY ACROSS INDUSTRIES AND OVER TIME?
— José Mata
- 6/95 PROCUREMENT FAVORITISM IN HIGH TECHNOLOGY
— Fernando Branco
- 7/95 MARKETS, ENTREPRENEURS AND THE SIZE OF NEW FIRMS
— José Mata
- 1/96 CONVERGENCE ACROSS EU COUNTRIES: INFLATION AND SAVINGS RATES ON PHYSICAL AND HUMAN CAPITAL
— Paulo Soares Esteves
- 2/96 THE OPTIMAL INFLATION TAX
— Isabel Correia, Pedro Teles
- 3/96 FISCAL RULES OF INCOME TRANSFORMATION
— Isabel H. Correia
- 4/96 ON THE EFFICIENCY AND EQUITY TRADE-OFF
— Isabel H. Correia
- 5/96 DISTRIBUTIONAL EFFECTS OF THE ELIMINATION OF CAPITAL TAXATION
— Isabel H. Correia
- 6/96 LOCAL DYNAMICS FOR SPHERICAL OPTIMAL CONTROL PROBLEMS
— Paulo Brito
- 7/96 A MONEY DEMAND FUNCTION FOR PORTUGAL
— João Sousa
- 8/96 COMPARATIVE EXPORT BEHAVIOUR OF FOREIGN AND DOMESTIC FIRMS IN PORTUGAL
— Sonia Cabral
- 9/96 PUBLIC CAPITAL ACCUMULATION AND PRIVATE SECTOR PERFORMANCE IN THE U.S.
— Alfredo Marvão Pereira, Rafael Flores de Frutos

- 10/96** IMPORTED CAPITAL AND DOMESTIC GROWTH: A COMPARISON BETWEEN EAST ASIA AND LATIN AMERICA
— Ling-ling Huang, Alfredo Marvão Pereira
- 11/96** ON THE EFFECTS OF PUBLIC AND PRIVATE R&D
— Robert B. Archibald, Alfredo Marvão Pereira
- 12/96** EXPORT GROWTH AND DOMESTIC PERFORMANCE
— Alfredo Marvão Pereira, Zhenhui Xu
- 13/96** INFRASTRUCTURES AND PRIVATE SECTOR PERFORMANCE IN SPAIN
— Alfredo Marvão Pereira, Oriol Roca Sagales
- 14/96** PUBLIC INVESTMENT AND PRIVATE SECTOR PERFORMANCE: INTERNATIONAL EVIDENCE
— Alfredo Marvão Pereira, Norman Morin
- 15/96** COMPETITION POLICY IN PORTUGAL
— Pedro P. Barros, José Mata
- 16/96** THE IMPACT OF FOREIGN DIRECT INVESTMENT IN THE PORTUGUESE ECONOMY
— Luísa Farinha, José Mata
- 17/96** THE TERM STRUCTURE OF INTEREST RATES: A COMPARISON OF ALTERNATIVE ESTIMATION METHODS WITH AN APPLICATION TO PORTUGAL
— Nuno Cassola, Jorge Barros Luís
- 18/96** SHORT-AND LONG-TERM JOBLESSNESS: A SEMI-PARAMETRIC MODEL WITH TIME -VARYING EFFECTS
— Pedro Portugal, John T. Addison
- 19/96** SOME SPECIFICATION ISSUES IN UNEMPLOYMENT DURATION ANALYSIS
— Pedro Portugal, John T. Addison
- 20/96** SEQUENTIAL AUCTIONS WITH SYNERGIES: AN EXAMPLE
— Fernando Branco
- 21/96** HEDGING WINNER'S CURSE WITH MULTIPLE BIDS: EVIDENCE FROM THE PORTUGUESE TREASURY BILL AUCTION
— Michael B. Gordy
- 22/96** THE BRICKS OF AN EMPIRE 1415-1999: 585 YEARS OF PORTUGUESE EMIGRATION
— Stanley L. Engerman, João César das Neves
- 1/97** LOCAL DYNAMICS FOR PLANAR OPTIMAL CONTROL PROBLEMS: A COMPLETE CHARACTERIZATION
— Paulo Brito
- 2/97** INTERNATIONAL PORTFOLIO CHOICE
— Bernardino Adão, Nuno Ribeiro
- 3/97** UNEMPLOYMENT INSURANCE AND JOBLESSNESS: A DISCRETE DURATION MODEL WITH MULTIPLE DESTINATIONS
— Pedro Portugal, John T. Addison
- 4/97** THE TREASURY BILL MARKET IN PORTUGAL: INSTITUTIONAL ISSUES AND PROFIT MARGINS OF FINANCIAL INSTITUTIONS
— Bernardino Adão, Jorge Barros Luís

- 5/97** **ECONOMETRIC MODELLING OF THE SHORT-TERM INTEREST RATE: AN APPLICATION TO PORTUGAL**
— Nuno Cassola, João Nicolau, João Sousa
- 6/97** **ESTIMATION OF THE NAIRU FOR THE PORTUGUESE ECONOMY**
— Carlos Robalo Marques, Susana Botas
- 7/97** **EXTRACTION OF INTEREST RATE DIFFERENTIALS IMPLICIT IN OPTIONS: THE CASE OF SPAIN AND ITALY IN THE EUROPEAN MONETARY UNION**
— Bernardino Adão, Jorge Barros Luís