Regime switching and transmission mechanisms of monetary policy in Japan at low interest rates

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1. Introduction

After the collapse of the asset price bubble in the early 1990s, the Japanese monetary authorities have sharply but gradually reduced interest rates. Since the mid-1990s the Japanese economy has entered a new stage characterised by very low interest rates, with the lower bound of zero reached from early 1999 until August 2000. Since then the Bank of Japan has tried to lift interest rates back to positive territory but retreated to its earlier stance in late March 2001. Given that the restart of positive Japanese economic growth has not yet materialised and that deflation is still going on, such decisions arise heated controversy among both academics and policy makers (See Amirault and O'Reilly, 2001, or Oda and Okina, 2001, for a survey of the proposed policy options). The latter disagree on the likely effects of such rate changes both on output and prices in the short as well as in the medium run. One of the main issues to be addressed is whether, with such near zero (less than one per cent) interest rates, during the nineties the transmission mechanisms of monetary policy were any different from what they are under more “normal” circumstances and when did the change in regime occur?

The unique experience of Japan in the late nineties has justifiably raised the interest of many academics. Such contributions stress that if the interest rate is stuck close to zero, there is still a route for monetary stabilisation policy operating through the monetary base and/or via the foreign exchange market. Thus, some argue that a rise in the monetary base can stimulate real income even in periods with near-zero interest rates (Meltzer, 1998; 2000). Others (e.g. Bernanke, 2000; McCallum, 2000; Svensson, 2000) support the view that a depreciation in the yen, engineered by central bank intervention in the foreign exchange market, can similarly reflate the economy. Considering the lack of success of Krugman (1998) style reflationary policies, based on a restart of inflation expectations, in convincing the board of the Bank of Japan (BOJ), the impact of alternative instruments of monetary policy is worth considering as a potential basis for an escape route for Japan.
The present paper focuses exclusively on the effects of policy shocks, i.e. temporary measures, and may thus seem ill-suited to assess the impact of supposedly “permanent” measures. However, one should be cautious about dubbing as permanent monetary policy measures which may be reversed in the near future. One example is the assertion late March 2001 by the BOJ that it would keep its key interest rate at zero until CPI inflation starts to be positive again. It is worth recalling that a year earlier (13 April 2000) the BOJ similarly announced that it would pursue a zero interest rate policy until deflationary concerns disappeared (Oda and Okina, 2001, p. 328), and yet four months later it lifted interest rates back to positive territory.

Given the scant empirical evidence available, compared to the explosion of proposals and recent wave of theoretical modelling, there is need to provide an empirical basis in order to assess three series of issues in Japan: do interest rate changes have any impact on output and prices? Do changes in bank reserves have an impact even at near zero interest rates? Can exchange rate depreciation be the “foolproof” (Svensson, 2000) way out of the liquidity trap?

The empirical study of the output and price effects of monetary policy using the workhorse in macroeconomic time series analysis, i.e. VARs (vector auto-regressive models), has been a very intensive area over the last decade (Sims et al. 1990; Favero, 2000). Such work has usually put a lot of emphasis on the interest rate and money transmission channels. However, one may wonder, particularly in the case of Japan, whether some other transmission channels could not play a role. Among those, asset price (and to a lesser extent credit) channels are typical candidates. We will argue that the study of the role played by asset prices should not be confined to the exchange rate. Indeed, given the prominent role played by share prices in the Japanese economy, through wealth effects on consumption, Tobin’s q type effects on investment or possibly through the asset side of banks’ (as well as firms’) balance sheets, we will consider to what extent share prices represent a key variable (the recently dubbed “stock market channel” of monetary policy) and whether supporting them can also play a role in stimulating output. The
various ways in which such a support can be provided are currently a hotly debated issue in Japan.

A number of empirical studies have evaluated the transmission channels of monetary policy in Japan. Representative work are Morsink and Bayoumi (2000) or Cargill-Hutchison and Ito(2001). However, the common weakness of many of the works in this area is that they consider that the 1980s and 1990s (or the late 1980s and the 1990s for Braun and Shoji, 2000) are a homogenous period, providing the researcher with a long sample from which lessons can be drawn for current policy issues in Japan. Even on a theoretical basis, the validity of such an approach seems doubtful for a country where interest rates have come down to almost zero in only the latter part of the period. Indeed in a standard stochastic model, Orphanides and Wieland (1998) show that, when inflation is lower than one per cent, non-linearities in the transmission process of monetary policy arise solely from the presence of the zero bound on nominal interest rates. Indeed, these effects become increasingly important for determining the outcome of policy in circumstances with such low inflation rates. On an empirical level, accounting for regime shifts should be a major concern when examining the transmission mechanisms of monetary policy. One should allow for the possibility that such relationships depend on the regime that occurs at any given point in time. We will thus allow for stochastic regime switching within a vector-autoregressive model.

The strategy we implement starts by isolating the different stable regimes of monetary transmission in Japan since the start of floating in 1973 up to 2001. Then for the stable post-bubble collapse regime, we examine the response of the economy to monetary policy shocks in the light of the approach advocated by Christiano, Eichenbaum and Evans (1999).

In the second section we will briefly review the main transmission channels of monetary policy as isolated by theoretical work in this area, both within a partial equilibrium and a general equilibrium setting. The third section will present the results of our empirical work on the transmission channels of monetary policy shocks, using both Markov switching VARs to identify stable regimes and impulse response functions for the
stable regime of the 1990s. In the fourth section, we will briefly review the argument in favour of an intervention-led yen depreciation as a way to reflate the Japanese economy and empirically assess its validity as well as the efficacy of an alternative policy of share price support. The final section will offer some conclusions and will give some details on some recent proposals aiming at lifting share prices in Japan.

2. Transmission channels of monetary policy and the role of the stock market.

a) Partial equilibrium context.

Existing theoretical work on the transmission of monetary policy shocks to the real economy has emphasised three series of channels (Mishkin, 1996), the relevance of which has recently received renewed interest in Japan (Oda and Okina, 2001). In the first, or money transmission, channel, contractionary monetary policy, through lower money supply, leads to a rise in short-term interest rates (the liquidity effect), which itself triggers an increase in the cost of capital, leading to a fall in aggregate demand through lower investment spending by both consumers and firms (Taylor, 1995).

The second series of channels questions the almost exclusive focus of the money transmission channel on one asset price, the interest rate. Indeed, both the exchange rate and share prices can play a major role. In an open economy an asset price channel operates through the exchange rate, which impacts directly on the consumer price index via changes in the domestic value of imports. To the extent that the exchange rate usually responds quickly to interest rate changes, this leads to a faster transmission of monetary policy to domestic inflation. Moreover, given sticky nominal wages and prices, real exchange rate effects lead to a substitution between domestic and foreign goods, and in turn to changes in domestic economic activity (Taylor, 1995).

Monetary policy can affect the whole spectrum of relative asset prices and real wealth through share prices (Meltzer, 1995). A fall in money supply (associated with a rise in short-term interest rates) thus leads agents to sell equities in order to obtain the
cash balances that are now in short supply. The fall in share prices can dampen private spending through two channels, involving respectively Tobin’s $q$-theory of investment and wealth effects. According to the former, the fall in stock prices leads to a lower market value of firms relative to the replacement cost of capital (the $q$-ratio) generating a fall in investment by firms. The latter channel implies that the fall in financial wealth of consumers associated with lower equity prices leads them to cut their consumption in line with the fall in their lifetime resources.

Portfolio-rebalancing effects play a major role in the transmission mechanisms of quantitative easing through short-term or long-term market operations. In both cases the central bank purchases government bonds with base money. The extent to which portfolio effects can play a role depends on the difference in the “moneyness” between the assets bought and sold by the Bank. Moneyness is defined as the marginal cost for a money holder, i.e. the opportunity cost of holding each monetary asset. Short-term government bonds have the same moneyness as base money when interest rates are very close or equal to zero. As a result, no portfolio effect can operate through a money market operation involving such assets because the latter are almost perfect substitute with base money under such conditions (Oda and Okina, 2001; Meltzer, 1999). However, portfolio effects could still be present if the central bank decided to operate on the long-term government bond market.

The third series of channels involves credit markets where imperfect information is a major feature. The emphasis is then put either on the bank lending channel or on the balance-sheet channel (e.g. Bernanke and Gertler, 1995). A restrictive monetary policy shock can generate a fall in bank deposits which will lead banks to reduce their lending. As a result investment by firms, or by consumers, will fall, resulting in a decline in output. Besides, the balance-sheet channel stresses both the fall in collateral as well as the rise in moral hazard associated with a fall in the net worth of firms. The impact of monetary policy may be substantially different depending on the degree of weakness of banks’ balance sheets, or on the type of borrowers (e.g. small vs. large firms, Kasyap and Stein, 1994).
Some of these different channels may very well coexist and complement each other, as exemplified by Kashyap and Stein (1994) in the case of the credit channel and the traditional money channel. Moreover, in the Japanese case the asset price channel may interact with the credit channel through changes in the value of shares held by banks.

\[ b) \textit{General equilibrium framework}. \]

Recently general equilibrium models have considered the impact of monetary policy on the stock market in different ways, conditioned by the form in which money is accounted for.

Money in the utility function models (Boyle, 1990) are based on the inverse relationship between equity prices and the velocity of money. Such a relationship was accounted for by Friedman (1988) through either a wealth effect, a risk spreading effect or a transactions effect.

Modelling monetary policy explicitly in a cash in advance model a la Lucas (1982), Boyle and Peterson (1995) show how the correlation between equity returns and inflation depend on monetary policy. If the latter is strongly pro-cyclical, equity returns will be positively correlated with inflation, while such a correlation will be negative with a counter-cyclical (or a weakly pro-cyclical) monetary policy.

The limited participation assumption (Lucas, 1990; Christiano et al. 1997) incorporates credit market imperfections. Indeed, because of adjustment costs, households do not adjust the cash they send to financial intermediaries immediately after a monetary policy shock. A major implication is that open market operations have a disproportionate effect on bank reserves with the central bank. The effect of monetary policy shocks on the stock market (the ‘‘stock market channel’’) varies depending on the specification of the limited participation model considered. In Chami et al. (1999)’s model, expansionary monetary policy generates inflation which, through its negative impact on the value of firms’ assets, acts as a tax on their capital stock. The latter effect generates a fall in real
stock returns and also equity prices. By contrast, Neri (2001) assumes that the firms’ stock of capital is fixed so that such an effect does not occur. As a result the rise in current and expected future dividends, linked to the fall in the cost of firms’ debt (fall in the interest rate), leads to a rise in equity prices after an expansionary monetary policy shock.

With respect to the impact of monetary policy on the stock market, most of the empirical literature has focused on the money-equity prices or inflation-equity prices relationships (see Sellin (2001) for a survey). Existing empirical evidence on the effects of monetary policy on stock prices in G7 countries went through two successive steps. Initial studies, where monetary policy was measured by changes in M1, found that easier monetary policy had a negative impact on equity prices. However, the interpretation of the results of such studies was difficult since changes in M1 could reflect changes in money demand as well as in supply. Recent studies, which have measured changes in monetary policy more carefully, have found that easier monetary policy impacts positively on share prices (Sellin, 2001).

3. Evaluating the respective role of the different channels in the 1990s.

a. Methodological approach

We are concerned here with the unanticipated effect of monetary policy and rely on the identification of monetary policy shocks. Such a focus is synonymous with a concern for the unsystematic part of interest rate movements (for a concern with the systematic part, see McCallum, 1999; on the alternative approach implemented here, see Favero, 2000), defined as all variations in central bank policy that cannot be accounted for by a rule-based reaction to the state of the economy. Such a study of the effects of deviations from rules is a means to collect information on the response of macroeconomic variables to monetary impulses that are not expected by the market.

1 Chami et al. (1999) argue that the ‘stock market channel’ would have become prominent in the 1990s. Not only have stock owners become more assertive over this period (shareholder activism), but managers react
In the tradition of Sims, Stock and Watson (1990), the specification of a VAR system that we use considers variables in levels. In the case of such VARs with polynomial functions of time and one or more unit roots, Sims et al. (1990; see also Hamilton, 1994, chapter 18) showed that, independently of the order of integration of the variables, one can get a consistent estimation of coefficients. Even when the data are nonstationary there is no requirement to transform the VAR into a VECM form for meaningful inference to be carried out (Canova, 1995). Such a framework is appropriate if one is interested in studying the impact of shocks within impulse response functions exercises (Christiano et al., 1999). An alternative route would consist in focusing on target variables such as the output gap rather than the level of output, and inflation rather than the price level. However, both would raise problems. In the case of Japan, the output gap is a loosely defined concept since there is much uncertainty as to the level of potential output (Kamada and Masuda, 2001; and Bayoumi, 2000). Similarly, focusing on the rate of inflation would not seem adequate when examining a period of overall price stability. Movements in the price level then seem to be the relevant variable of interest.

The structure in the VAR that we use ranks first non-policy variables such as the consumer price index and industrial output. Policy variables are ranked second since they are considered to be affected contemporaneously by non-policy variables, but the latter are assumed to be affected by monetary policy shocks only with a one-period lag (Christiano et al., 1999).

In line with most existing work in this area (Christiano et al, 1999; and Favero, 2000 for a survey), we consider the effects of monetary policy shocks on both real economic activity and prices. Leaving out prices, as in Miyigawa and Morita (1998), particularly in the case of Japan, would miss the possible role of deflation induced by restrictive monetary policy as a transmission channel of policy. We started from a core VAR system with two lags (for a similar choice see Braun and Shioji, 2000). However, given the (often) short sample at our disposal and the fact that this had no impact on the results we report the results with only one lag.

to movements in their firms’ stock prices through various direct or indirect incentive schemes.
A substantive issue relates to the appropriate sample to be considered in the econometric study. It is often emphasised that VAR models of the monetary transmission mechanism should be estimated within a single policy regime (Favero, 2000) because regime shifts require different parametrisations (see also Bagliano and Favero, 1998). When estimated over different policy regimes, VAR models of the monetary transmission mechanism show evidence of structural instability. Accordingly, we use a regime-switching VAR model in order to isolate stable regimes.

b. The search for a stable regime with a MS-VAR model.

One possibility would be to consider models which characterise regimes by an observable variable (relative to a threshold value) but these imply that regimes are known with certainty. By contrast, we will consider here models in which the regime is determined by an underlying unobservable stochastic process \( s_t \), i.e. in which one assigns probabilities to the occurrence of the different regimes. In its most popular version, which we will use here, such a model assumes that the process \( s_t \) is a first-order Markov process (Hamilton, 1994). As a corollary, the current regime only depends on last period regime. Instead of focusing on a single equation framework where output would be assumed to follow a regime-switching process we consider a regime-switching VAR (Krolzig, 1998).

The specification of a VAR system which we use, considers variables in level in line with the approached suggested by Sims et al (1990) and Christiano et al. (1999). We estimate a VAR model with regime switching (MS-VAR) such as:

\[
(7) \ y_{St} = \alpha_s + \Gamma_{Sj} y_{t-j} + \beta t + \gamma_t
\]

where \( y_t \) = (industrial output, consumer price index, call money rate, bank reserves with the BOJ, government bond yield, share price, yen-dollar rate, all from I.M.F. International Financial statistics CD-ROM), \( t \) stands for a deterministic time trend and \( s_t \) denotes an unobservable discrete regime variable which takes on a finite number of positive integer values (1,......,\( q \)) and \( \varepsilon_t I S_t - N(0, \Omega_{S_t}) \). We assume here that \( s_t \) follows and
We take a lag length \((j)\) of one month in order to save on degrees of freedom.

We examine the period starting with the switch to floating in March 1973 and ending in June 2001. We allowed for up to four different regimes but obtained consistent results with three regimes. Once in a regime, the probability of staying in that regime is very close for the three regimes (respectively 0.924, 0.933 and 0.922). The second regime lasts on average a little longer (15 months) than the other two (13.2 months for regime One and 12.8 months for regime Three). These regimes have an unequal number of observations with the second one having the largest number (180), followed by the first regime (103) and the third one (54).

Regime Three seems to correspond to the two oil shocks: late 1973 through late 1975, and late 1979 through mid-1981. It seems to have also characterised brief periods in the mid-1980s around the very early phase of dollar depreciation, and in late 1990 with a link to the Kuwait. Indeed the oil price hike lasted from August to December that year.

Regime Two could be referred to as the “normal” regime in Japan. This would have started after the switch to floating and carried on until sometime in 1992, with interludes where regime Three was at work and a brief spell of regime One in 1977.

Regime One appears to be identified with the post-bubble economy in Japan. It starts late 1992 or early 1993 and carries on until the summer of 2001. There are only two occasions where regime Two seems to creep back very briefly in the second half of the nineties: early 1995, April 1997 and late 1999-early 2000.

The results of the regime switching analysis imply that examining the transmission mechanisms of monetary policy in Japan over the eighties and nineties (as for instance in Morsink and Bayoumi, 2000) would not yield any meaningful result. However, even focusing on the 1990s does not seem adequate, since the post-bubble collapse regime only starts in 1993.

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2 The Markov assumption is in some situation questionable and in an univariate context the transition probabilities have been modelled as time varying and dependent on some variables (Gray, 1996).
We ran a similar regime switching exercise without a deterministic time trend in the VAR. Results were very similar except that the start of regime One is postponed until mid 1995, i.e. at the time when interest rates start collapsing under one per cent. Since allowing for a trend would seem to generate more robust results and allows us to use a longer sample, we mostly favour results obtained from such a specification. In order to check the robustness of the results, we also re-ran the estimation over the June 1995-July 2001 period without a trend. When the latter results do not differ from the former, we do not report them below.

Figure 1: Probabilities of the three regimes during the 1973-2001 period.

c. The effectiveness of bank reserve expansion.

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3 This is all the more important when studying the effects of interest rate shocks since this gives more occurrences of interest rate movements.
In the light of the results of the regime switching exercise with a trend, we now estimate a vector autoregressive model for the period from January 1993 to July 2001. The estimated model is a VARX such as:

\[(2) y_t = \alpha + \Gamma_j y_{t-j} + \Phi_k x_{t-k} + \mu \text{DUM}_i + \beta t + \gamma_t\]

Over this period we complement the I.M.F. data with official Japanese data either from METI or from the central bank. Rather than industrial output (available in IFS), we use a broader measure of economic activity, i.e. the all-industry output (compiled by the METI). The all-industry index takes a reading of activity in six tertiary industries (utilities, transport and telecommunications, wholesale and retail, finance and insurance, real estate and services), combined with activity in the construction, agricultural and fisheries industries, the public sector and industrial production. This index (available since 1993) is considered a close approximation for Gross Domestic Product, which is not available at a monthly frequency, as measured by industrial and service sector output. Besides, given the unavailability of land prices on a monthly basis, we had to neglect such a variable in the empirical work.

When assessing the asset price transmission mechanism, three share price indices were initially considered: the Nikkei index, the Topix index and the Datastream broad-market index. The results appeared robust to the use of the share price index and the analysis presented below employs the Topix market index.

The core VAR comprises as endogenous variables (the y’s in model (2)) seasonally adjusted all-industry production (LINDALLSA), the seasonally adjusted consumer price index (LCPI), the call money rate (CALL), and commercial bank reserves (LRESBK) with the BOJ (adjusted for changes in reserve requirements), and broad money (LMQMCD) with all variables in logarithm except interest rates. We include as exogenous variables (the x’s) the log of public debt (in order to control for fiscal policy), of the share price and of the yen-dollar rate, each entering with one lag. In order to account for the rise in the V.A.T. rate, we included a dummy for April 1997. However,
we checked that the results are not sensitive to their inclusion. We refrained from dummying out the early 1995 period since this is characterised by substantial monetary policy impulses. We experimented with a dummy for the year-two thousand effect (December 1999 through March 2000), but its inclusion does not alter the effects of a bank reserve shock. We thus left it out in the results presented here. We also checked that the results are insensitive to the lengthening of the lag length to two months.

As a first step, we check that the model matches the stylised facts on the effects of an expansionary policy shock, as established by Christiano et al (1999), using impulse response functions. They conclude that plausible models of the transmission mechanism of a monetary expansion should be consistent at least with the following evidence on price, output and interest rates: i) the aggregate price level initially responds very little, ii) output initially rises, with an inverted j-shaped response, with a zero long-run effect of the monetary impulse, and iii) interest rates initially fall. Figure 2 presents the results from a positive bank reserve shock. Over the 1993-2000 period, a shock on bank reserves of one standard deviation has no effect on the price level but does lead to a fall in the interest rate (the liquidity effect) and to a rise in all-industry output, while the last two are both insignificant. The significance of the output effect would be a little surprising in the case of Japan in the second half of the nineties since, as discussed in the previous section, at near-zero interest rates, base money and short term bills should be perfect substitutes. Broad money, in its usual definition in Japan (M2 plus certificates of deposit) does not rise significantly, with effects being only temporary, after the bank reserve shock. This vindicates the observation by Bernanke (2000) to the effect that over this period in Japan a rise in base money does not lead to equivalent increases in broad money. We checked that the bank reserve shock has no (significant) effect on the government bond yield.
Some authors (e.g. Meltzer, 2000) argue that a large depreciation of the yen should result from the expansion in bank reserves. In order to assess this argument, we focus on the yen-dollar exchange rate since Japan’s nominal effective exchange rate moves in close synchronisation with the former (Ramaswamy and Samei, 2000). The core model is extended by including the yen-dollar exchange rate as an endogenous variable to capture other transmission mechanisms. By contrast with Meltzer’s view, the inclusion of the yen-dollar rate in our VAR system shows that the yen does not respond to the bank reserve shock. It thus does not seem valid to assert in the case of Japan in the second half of the
1990s that: “the exchange rate appears to be an important variable in the transmission of monetary changes” (Meltzer, 2000). By contrast, when included endogenously in the VAR, share prices (LSHAREP) are significantly and positively affected by a bank reserve shock (figure 3), implying that the output effects of the reserve shock are longer-lived, but remain small (and not significant). Now the (delayed) response of the interest rate has the wrong sign, but remains insignificant.

Figure 3: Impulse responses to a bank reserve shock, with share price.
d. The transmission mechanisms of interest rate shocks.

The core model was altered to a four-variable VAR, with broad money excluded, to analyse the effects of a shock to the call money rate (we keep the same exogenous and dummy variables as in the shock on bank reserves). The results are presented in figure 4, where the response of consumer prices is seen to be non-significant. All-industry output falls in an increasing way over the first semester and gets back to its initial level (its change becomes insignificant) after twelve months. A 8.5 basis points rise in the call rate leads to at most a 0.11 % fall in all industry output. In such a simple system no output puzzle is apparent. Here, as well as in more complex systems, we experimented with the inclusion of a commodity price index (I.M.F. series of export price of commodities) but there were no substantive changes in the transmission channel, so we decided to drop such a variable in order to save on degrees of freedom. Besides the lack of any price puzzle did not call for the inclusion of such a variable. The traditional money channel, through bank reserves does not operate, since the impact of the shock in the call money rate on such reserves is insignificant.

Figure 4 : Impulse responses to an interest rate shock with bank reserves.
We specified the interest rate channel by examining separately (results not reported) the impact of the interest shock on the bank spread as measured by the difference between the average interest rate on long-term loans (source BOJ database) and the call rate. The spread falls on impact and gets back to its initial level after a year. The presence of this channel marginally magnifies the fall in output generated by the call rate shock.

Figure 5: Impulse responses to an interest rate shock with bank loans (and loan rate).

Bank credit responds significantly after three months and lasts for two years (figure 5). Its movements closely follow the fall in all-industry output. However the presence of
Figure 6: Impulse responses to an interest rate shock, with government bond yield and share prices

Response to One S.D. Innovations ± 2 S.E.

Response of LINDALLSA to CALL
Response of LSHAREP to CALL
Response of CALL to CALL
Response of GBYIELD to CALL
Response of LRESBK to CALL
Response of LPCT to CALL

this variable far from magnifying the output effect of the rise in the call rate, tends to reduce it at the margin. We also examined the effect of a shock on the call rate on the bank loan rate. The variable included is the average contracted interest rate on new loans and discounts (LOANINTAV, extracted from the BOJ database). Such a loan rate does respond to the call rate shock but less than proportionately (figure 5). In other words the lowering of its key interest rate by BOJ is passed through less than one for one by
commercial banks\(^4\). As a result, the change in output is marginally less substantial than when this variable is not taken into account.

When the government bond yield is included in the VAR framework (see figure 6 or figure 7), it is significantly affected by an interest rate shock only for the first six months after the shock and the impact is almost one for one. There is thus little evidence that the transmission mechanism of Japanese monetary policy at a time of near-zero interest rates would work essentially through the effects on the term structure of interest rates (for a contrary view, see Ueda, 2000).

In order to examine the relevance of the various transmission channels highlighted in the previous section, we experimented by adding extra endogenous variables to the VAR: bank credit to the private sector (LCREDIT), share prices, the yen-dollar exchange rate (LYENDOL) or the government bond yield (GBYIELD).

Figure 6 presents results from a system including share prices (with the yen-dollar and public debt, lagged one month, exogenous). The latter fall sharply for six months after the interest rate shock and recover over the subsequent two years. The maximum fall in all-industry output is slightly larger than without the share price channel in action.

The impact of the inclusion of the yen-dollar rate, among the endogenous variables (with share prices and public debt, lagged one month, exogenous), is shown in figure 7. Given that the response of the yen is insignificant, we do not find the appreciation in the yen vis-à-vis the dollar following a positive interest rate shock which would have been in line with consensus effects emphasised by Christiano et al. (1999). There is also insignificant evidence of imported deflation.

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\(^4\) The lack of full response of bank loan interest rates to decreases in the BOJ rate in the 1990s is motivated by Kato, Ui and Watanabe (1989) by the rise in marginal costs of managing and monitoring loans with the fall in borrowers’ net worth.
Figure 7: Impulse responses to an interest rate shock, with government bond yield and yen-dollar.

4. Can asset price changes be the new hidden weapon of Japanese monetary authorities?

a. yen depreciation as an instrument of Japanese monetary policy.

It was recently suggested that in a situation of zero interest rate policy, the central bank could reflate the economy by pushing towards a depreciation of the yen via purchases of foreign exchange with high powered money. According to its advocates, such “a policy of aggressive foreign-exchange intervention to put downward pressure on
the yen would by itself probably suffice to get the Japanese economy moving again” (Bernanke, 2000, p. 15).

The standard objection to this proposal is that since monetary policy would have been made ineffective by the liquidity trap, foreign exchange market intervention by the Bank of Japan would be nothing else than sterilised intervention. There is a consensus view in the literature (see the survey by Girardin, 2000) to the effect that sterilised interventions are unable to influence the value of a currency (i.e. the level of the exchange rate), in a lasting and substantial way. Available empirical evidence concludes that if intervention works, it only impacts on exchange rate volatility. In the light of such evidence, it is likely that intervention aimed at changing the level of the yen exchange rate may end up influencing only its volatility, which may increase the volatility of output and not its level.

Evidence on the efficacy of Japanese intervention is scant, given the past refusal of the Bank of Japan to publish its intervention data. However, a recent econometric study of the 1995-1999 period uses information on the occurrence of foreign exchange interventions in the yen-dollar market collected from the electronic archives of the financial press (Ramaswamy and Samiei, 2000). This study concludes that “there may indeed be a role for foreign exchange interventions …given that interventions have succeeded on a number of occasions during 1995-99 in changing the path of the yen-dollar rate in the desired direction”…“even though the interventions in the yen-dollar market were routinely sterilised”(op. cit. p. 78 and 59). One should stress that “the typical intervention when successful has a relatively small, though persistent, impact on the yen-dollar” (ibid., p.78).

5 While there is currently a near consensus on the negligible size of the effects associated with the portfolio channel, the “signaling of future changes in monetary policy” channel is often considered as the only alternative channel through which central banks should rely in the hope of their intervention to have any effectiveness (Girardin, 2000). Recent theoretical work shows that a third channel should be considered more relevant. Such a channel is based on the release by the central bank through its interventions of information on its exchange rate target. The two types of signalling channels generate conflicting predictions with respect to the effects of intervention on the level as well as the volatility of the exchange rate, and on the profitability of interventions. Empirical work on daily data mostly validates the alternative signalling channel.
For some reason the justifications recently put forward for the efficacy of potential intervention by the Bank of Japan on the foreign exchange market seems to ignore the teachings of existing work on the subject. The ability of large-scale intervention to lead to a depreciation in the yen is defended by Bernanke (2000) as “reductio ab absurdum” argument. We should imagine that the BOJ prints domestic currency in order to buy foreign currency. A depreciation of the yen should result. Otherwise the BOJ could be led to acquire infinite quantities of foreign assets, with the end result that foreigners would be left with yen holdings. Since this is impossible in equilibrium, it will not happen.

The argument presented by McCallum (2000) seems to be of a different nature, since it focuses on the systematic part of monetary policy, in the shape of a feedback rule with an exchange rate instrument. However, it relies in a similar way on the portfolio balance channel for the efficacy of intervention in the foreign exchange market. Similarly, Svensson (2000) claims to offer a “foolproof” way for Japan to escape from the liquidity trap and recession: a combination of a price-level target path with positive inflation and a yen devaluation with a temporary exchange rate peg. In his view, such a package is more general than McCallum’s suggestion since its efficacy would not depend on any portfolio-balance effects of foreign exchange interventions (Svensson, 2000). However, even for Svensson, “one can think of the temporary peg as supported by a threat of foreign exchange interventions of huge volumes, at which a portfolio-balance effect would realistically appear and depreciate the currency. This threat would exclude the possibility that the peg would fail”(op.cit. p.25). The latter assumes that the upper limit to how much domestic currency the central bank is willing to issue (anticipated by the market) is very large. “It is realistic at such volumes of currency issue that domestic currency would no longer be a perfect substitute for foreign assets and some portfolio-balance effect would appear and depreciate the domestic currency” (ibid. p. 35).

Such proposals refer to (hopefully) lasting monetary policy measures by the Bank of Japan, and thus involve permanent measures as opposed to the temporary monetary policy shocks as considered in the present paper. However, the methodology we use can still shed some light at least on the transmission mechanisms of the proposed measures.
b. Would a yen depreciation or a boost to share prices reflate the Japanese economy?

When considering the effects of shocks on the exchange rate (and subsequently on share prices), we focus on the period with the zero-interest rate policy after mid-1996, without a time trend in line with our results on regime-switching. For the longer sample starting in 1993 (with a VAR including a time trend) we did not get meaningful results. We start by using our enlarged VAR system to examine the macroeconomic response of the Japanese economy to a shock in the yen-dollar exchange rate with the results displayed in figure 8. We include as exogenous variables public debt, the government bond yield and the call rate, both with one lag and add a dummy for April 1997. We prevent the call rate from responding since we assume that the zero interest rate constraint is binding. A shock to the yen-dollar, equivalent to a depreciation of the yen, generates a significant fall in share prices. It also leads to a fall in all-industry output, reaching its maximum after a year and a rise in the CPI. Both effects are not very significant. A ten percent depreciation in the yen would lead to a 0.5 percent fall in all-industry output and 0.4 percent CPI inflation. The negative effects of the yen depreciation on output are channelled via the fall in share prices. The latter may be explained by the exchange rate loss made by non-residents holding shares quoted in Japan, which leads them to sell part of their portfolio, possibly in association with capital outflows.

We separately examined further the channels through which a shock on the yen-dollar can have such an effect on output (results not reported). One of them is capital outflows. The yen depreciation leads to a fall in the (yen value of) net purchase of shares in Tokyo by U.S. residents. A 6 percent capital outflow is generated by a 10 percent yen depreciation. Such net sales can partly explain the fall in Japanese share prices. A second channel is the so-called “Japan premium”, i.e. the deviation of the interbank rate in Tokyo from the interbank rate in London (LIBOR). A rise in the yen-dollar in Japan generates after a few months a rise in the Japan premium. Such a premium rises by 5.5 percent after a 10 percent yen depreciation.
The lesson from the study of the transmission of interest rate shocks (discussed in section 3 above) was that these lead to a fall in share prices, which further depresses output. An extended VAR was estimated, with the yen-dollar exchange rate exogenous (with one lag), to consider to what extent a positive shock in share prices would stimulate output. We also include as exogenous public debt, the government bond yield and the call rate, with one lag and add a dummy for April 1997. Figure 9 illustrates that a ten percent rise in share prices leads to a 0.54 percent rise in all-industry output after a few months which dies out after a little more than a year. The response of all other variables is
insignificant. When including it in the VAR as an endogenous variable, we checked that the yen-dollar rate also does not respond.

Figure 9: Impulse responses to a share price shock.

The Japanese experience of interest rate policy destabilising the stock market prior to 1990 and attempting to stabilise it thereafter, was severely criticised by some observers. Thus Bernanke and Gertler (1999) find in their estimates of interest rate reaction functions for Japan that stock prices in turn have a negative and a positive coefficient. However, the point we stress here is different since the stimulation of share prices we are concerned with is relevant at a time of near-zero interest rates and where a stock market bubble is collapsed long ago.
5. Conclusion

This paper aimed at giving some empirical evidence on the nature of the transmission channels of monetary policy at a time of very low interest rates, as in Japan in the 1990s, as well as at providing some empirical basis in order to start assessing the transmission mechanisms through which alternative instruments of monetary policy may help reflating the economy.

We searched for stable regimes with Markov-switching VARs and isolated the post-bubble collapse period starting in 1993 as a stable regime. Over this period, the use of impulse response functions in a VAR in levels enabled us to establish that the main channels of transmission of interest rate shocks do not involve bank lending but mainly asset prices, essentially via the share price and not the exchange rate. Shocks on bank reserves have no significant effect on prices or exchange rates, and an almost insignificant impact on output which is not surprising at near-zero interest rates, where base money and short-term bills are perfect substitutes.

Our results lead us to recommend some caution in evaluating the often advocated “quick fix” out of the liquidity trap in Japan, in the shape of an intervention-led depreciation in the yen. Existing literature implies that such intervention is unlikely to influence the level of the yen through portfolio-balance effects. We find that exchange rate shocks would certainly help the country to get out of price deflation, but would have negative effects on output, through lower share prices, capital outflows and a rise in the “Japan premium”. By contrast, a positive shock on share prices would lead to a boost in output.

The possibility of reflating the economy through public share price support seems to have been overlooked by most researchers (though not by all observers) in this area, even though it may be a far better “foolproof” way out of the liquidity trap than yen depreciation. The details of implementation can involve the purchase of sizeable amounts of shares by publicly-owned financial institutions. Something similar to the action of the

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6 The current reform of the asset structure of the postal savings system is potentially a major step in this direction.
Hong-Kong government in its successful defence against speculative attacks would be conceivable. However, the Japanese public opinion may not be ready to accept such policies. Indeed, it seems that “ideas initially floated by the politicians, such as using public funds to buy shares, were met with horror by investors and appear to have been dropped” (Rahman, 2001). Alternative schemes have been floated by a coalition government panel, among those we can mention the easing of restrictions on share buybacks by companies, developing stock option schemes, encouraging companies to swap cross-held shares outside the market, and the accelerated introduction of US type defined contribution plans. However, such schemes would be slow to make their effects felt. For share prices to go up quickly, expectations of future dividends should improve. Of course one should keep in mind (as stressed by Oda and Okina, 2001) that the desirability of policy actions should be assessed not only on the basis of their ability to stimulate output but also by taking into account their feasibility, their costs and associated risks, as well as the danger of a deflationary spiral developing if nothing is done.

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7 An action to boost the stock market would be very timely given that starting with fiscal year 2001 the Japanese Financial Services Agency will compel banks to mark to market their portfolio of shares. Given the current level of the Nikkei, banks will have to acknowledge capital losses on such portfolios and will be forced to sell assets or scale down loans. An action aiming at raising the stock market price would thus enable the authorities to “kill two birds with one stone”.

References


