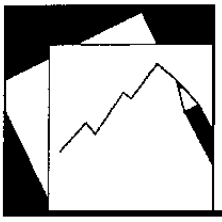
WP/03/112



IMF Working Paper

Retail Bank Interest Rate Pass-Through: Is Chile Atypical?

Marco A. Espinosa-Vega
and
Alessandro Rebucci

INTERNATIONAL MONETARY FUND

 WP/03/112

IMF Working Paper

Western Hemisphere Department

Retail Bank Interest Rate Pass-Through: Is Chile Atypical? [1]

Prepared by Marco A. Espinosa-Vega and Alessandro Rebucci

Authorized for distribution by Eliot Kalter

May 2003

Abstract

This paper investigates empirically the pass-through of money market interest rates to retail banking interest rates in Chile, the United States, Canada, Australia, New Zealand, and five European countries. Overall, Chile's pass-through does not appear atypical. Based on a standard error-correction model, we find that, as in most countries considered, Chile's measured pass-through is incomplete. But Chile's pass-through is also faster than in many other countries considered and is comparable to that in the United States. While we find no significant evidence of asymmetry in Chile's pass-through across states of the interest rate or monetary policy cycle, we do find some evidence of parameter instability, around the time of the Asian and Russian crises. However, we do not find evidence that the switch to a more flexible exchange rate regime in 1999 and the "nominalization" of Chile's interest rate targets in 2001 have affected significantly the pass-through process.

JEL Classification Numbers: E43, E52

Keywords: Interest Rates, Pass-Through, Central Bank

Author's E-Mail Addresses: MEspinosa@imf.org and ARebucci@imf.org.

---

[1] Paper prepared for the Sixth Annual Conference of the Central Bank of Chile, and will be published in the conference proceedings. We are grateful to Pablo Garcia, our discussant at the conference, Rodrigo Fuentes, Alain Ize, Saul Lizondo, Steve Phillips, Solange Berstein, Veronica Mies, Klaus Schmidt-Hebbel, Luis Oscar Herrera, and seminar participants at the Central Bank of Chile for useful discussions and comments. Andy Swiston provided outstanding research assistance. The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy, or those of the Central Bank of Chile. Remaining errors are ours. Corresponding author: Marco Espinosa (mespinosa@imf.org).

Contents Page

I. Introduction

There is little disagreement among economists that monetary policy affects the rate of inflation and, at least in the short run, the level of real economic activity. From an operational perspective, many central banks currently target a short-term market interest rate. This is done on the premise that this instrument is linked more or less stably to the final objectives of monetary policy through the so-called "transmission mechanism" of monetary policy.

Most of the literature on the transmission mechanism of monetary policy (e.g., Bernanke and Gertler, 1995; and Bernanke and Gilchrist, 1999) implicitly assumes that once the monetary authority's target rate is changed, short-term market and retail banking rates will follow suit—i.e., that there will be *immediate* and *complete* "pass-through" to retail banking rates. It is evident that if the pass-through to banking interest rates were sluggish and/or incomplete, those specific channels of the transmission mechanism of monetary policy that operate through banking rates would also be affected.

Stickiness of retail banking interest rates was first documented in the United States by Hannan and Berger (1991) and Neuman and Sharpe (1992). These authors study deposit rates setting using econometric models that were guided by theoretical models developed to analyze price stickiness in goods markets. Implicit in their analyses is the notion that banks cannot influence the behavior of lending rates because they are atomistic players in that market. Hence, they assume that there is immediate and complete pass-through to retail lending rates. Then they investigate the degree to which market power in the deposit market affects stickiness in deposit interest rates by looking at disaggregated data from large surveys of banks. Among other things, these early studies find that there is asymmetry in the pass-through to deposit rates, with lower pass-through when the market rate is increasing than when it is decreasing. These authors interpret their findings of asymmetric pass-through as evidence of market power in the deposit market.

Cottarelli and Kourelis (1994) were the first to measure and compare the degree of pass-through to lending rates across countries, including in their sample both developed and developing countries. Their empirical analysis is based on an autoregressive distributed-lag specification estimated with aggregate time series. They estimate the response of lending rates to changes in money market rates at different time-horizons. These responses are then regressed across countries against various measures of financial market structure, controlling also for other country characteristics including the effects of interest rate volatility. Thus, their analysis not only documents to which extent interest rate pass-through differed across countries, but also tries to explain why this was the case. In particular, they suggest that the following factors might reduce the degree of stickiness: (i) the existence of a market for negotiable short-term instruments, (ii) relatively limited volatility of money market rates, and (iii) relatively weak barriers to entry, though they do not find evidence that market concentration per se affects loan rate stickiness. Based on these findings, they suggest that to enhance monetary policy effectiveness policymakers should aim at enriching the menu of short-term marketable

instruments and removing barriers to competition, rather than trying reduce the level of market concentration.

More recent studies of the interest rate pass-through use similar econometric specifications, but focus mostly on euro-area countries. Mojon (2000), for example, measures the degree of pass-through for lending and deposit rates in five European countries: Belgium, Germany, France, Netherlands and Spain. He *assumes* that there is full pass-through in the long run and concentrates on estimating its size in the short term. He then goes on to study different interest rate cycles, trying to uncover possible asymmetries in the pass-through across states of this cycle. His main findings are that (i) retail rates respond sluggishly to changes in the money market rate, (ii) short-term rates generally respond faster than long-term rates, and (iii) there is asymmetry in the degree of pass-through, in particular pass-through to lending rates is larger when the money market rate increases than when it decreases, while the opposite is true for the deposit rates. He also finds that the results vary somewhat across countries. He conjectures that this heterogeneity could be due to differences in the microeconomic structure of the different countries' banking systems, but he provides no direct evidence on this.

A second example is provided by Bondt (2002), who estimates an aggregate autoregressive distributed-lag specification reparameterized as an error correction model for the euro area as a whole. In his analysis, deposit and lending rates of different maturities are paired with government bond yields of similar maturities. He finds that (i) pass-through is incomplete on impact, reaching only 50 percent within a month, for both lending and deposit rates, but (ii) is complete in the long run for most lending rates.[2]

Following Cottarelli and Kourelis (1994), Mojon (2000), and Bondt (2002), this paper compares Chile with a number of other countries. More specifically, it provides a set of stylized facts about the pass-through in Chile and compares them against the benchmark of a group of advanced economies' pass-through. We estimate the aggregate dynamic, reduced form relation between the money market interest rate and retail bank rates for Chile, Canada, the United States, Australia, New Zealand and a number of European countries, based on monthly data from 1993 to 2002, and try to interpret the evidence in light of previous studies and analyses.[3] But we do not test explicit hypotheses on the structure of the Chilean banking system. The analysis is based on an auto-regressive distributed lag specification re-parameterized as an error correction model, a standard methodology used in this literature. We estimate both the size and the speed of the pass-through from policy to retail banking rates, in the short run (on impact, within a month) and in the long run (in the steady state).

---

[2] Note that the pass-through from policy interest rates to retail banking rates may still be incomplete if the pass-through from policy rates to government bond yields is incomplete.

[3] See Berstein and Fuentes et al. (2003) for a complementary analysis using Chilean bank-by-bank data.

For Chile, we also ask whether these estimates differ across states of the interest rate or the monetary policy cycle and whether they have changed over time, especially after the 1998 Asian crisis and after the introduction of "nominalization" of policy interest rate target in 2001. By implementing these robustness checks we provide indirect evidence on whether market power in banking sector—consistent with the findings of Hannan and Berger (1991) and Neuman and Sharpe (1992) for the United States and Mojon (2000) for Europe—or other factors such as interest rate volatility—consistent with Cottarelli and Kourelis (1994) for developing countries—have affected the interest rate pass-through.

Our main conclusion is that interest rate pass-through in Chile, overall, is not significantly different from that of the other economies considered. In particular, we find that the size of Chile's long run pass-through is slightly smaller than that of Australia, Canada, and the United States and is comparable to that of New Zealand and the European countries in our sample. In Chile, however, the speed of pass-through is faster than in Australia, New Zealand, and several of the European countries' interest rate series. Moreover, it is only slightly slower than the pass-through in the prime rate for the United States and Canada in the short term.

For Chile as well as for most countries we also find that both the size and the speed of the pass-through decline as the maturity of the bank instruments considered increases. Unlike the studies reviewed above, for Chile, we do not find evidence of significant asymmetry in the pass-through. We do find some evidence of parameter instability over time, especially around the 1997-98 Asian and Russian crises, but we do not find marked evidence that there has been any significant further difference following the nominalization of Chile's interest rate targets.

A distinctive institutional feature of Chile is that there are two different types of domestic currency deposits and loan instruments: standard nominal instruments and instruments denominated in the *Unidad de Fomento* (UF), a unit of account that indexes financial contracts and transactions to the previous month's inflation rate. We look at both nominal and UF interest rates, but find that the results are broadly comparable, especially in the long run: the size of the long-run pass-through is about the same across these instruments. In the short run, instead, the pass-through for most UF rates appears slightly smaller than the pass-through for nominal rates.

As we explain below, we interpret the aggregate evidence reported on the *symmetry* and *instability* of the pass-through in Chile as suggesting that the behavior of retail banking interest rates is more likely to be affected by factors other than market power in the banking system, of which we suspect especially external shocks. Chile is a very open economy both on the current and the capital account of the balance of payments. Thus, the Chilean banking system is exposed to competition and entry from foreign banks (even if its current structure appears rather concentrated) and this might be mitigating market power of individual banks.
At the same time, Chile's openness, and the fact that the country was buffeted by significant external shocks during our sample period, might have affected banks' reactions to policy changes. High external volatility may also force more frequent policy changes.

On balance, Chile's interest rate pass-through does not appear too different from that in the other countries considered. But note that these results would not be inconsistent with the presence of some differences in the pass-through across individual bank instruments. Thus, a natural extension of our work would be to investigate explicit structural hypotheses across countries based on micro data and the predictions of an open economy of model of banking system competition.

The remainder of the paper proceeds as follows. In Section II, we describe the data we use and present a brief review of key cross-country similarities and differences in the row data. Section III describes the empirical model used. Section IV reports the estimation results, and Section V concludes.

II. The Data and a Few Stylized Facts

A. Sources and Definitions

In addition to Chile, we consider the United States, Canada, Belgium, Germany, France, Netherlands, Spain, Australia, and New Zealand. In all cases except Chile, the sample period is April 1993 to June 2002; for Chile, the sample ends in September 2002. The data are from national central banks, the European Central Bank, and the International Monetary Fund. A complete list of the interest rate series used is presented in Table 1.

For almost all countries considered, the money market rate is an overnight interbank lending rate. The only exception is Australia, for which we use the 13-week treasury bill rate due to apparent anomalies in the data for the interbank lending rate.

Retail interest rates are classified into three maturity buckets. Retail interest rates on instruments with maturities of less than three months are classified as short-term rates, rates on instruments with maturities of three months to a year are classified as medium-term rates, and rates on instruments with maturities of one to three years are classified as long-term rates.

The lending rates are for commercial loans, with three exceptions: (i) Canada's medium and long-term lending rates are for mortgages, (ii) the German long-term lending rate is for consumer loans, while (iii) for Chile the rates are for both consumer loans and commercial loans. For the United States, the only lending rate we considered is the prime rate, which is the base upon which many other loan rates are calculated. Canada's short-term lending rate is defined similarly, while its long-term lending rate is for one-year and three-year conventional mortgages.[4] The lending rates for Germany and Spain are averages for transactions that took

[4] By using the *prime* lending rate for Canada, and particularly the United States, we might be biasing the cross-country comparison against all other countries. As we shall see, in fact, these are among the very few interest rate series displaying full pass-through in the long run. The

place throughout the month, while for Belgium, France, and the Netherlands they are end-of-period rates. For Australia and New Zealand, we do not have lending rates by maturity. For New Zealand, we used the weighted-average-base business rate charged by the six largest banks (each bank reports the average rate on new loans of all maturities weighted by amount). For Australia, we used the weighted average rate charged by banks on business loans.

Our deposit rate series are generally more homogenous. Most of them are for demand deposits, certificates of deposit, or time deposits with maturities in the three buckets described above.[5]

For Chile, we consider both nominal domestic currency and UF interest rates. Studying UF interest rates is important because prior to August 2001, most bank intermediation was based on this unit of account. In August 2001, the Chilean Central Bank stopped targeting of the money market rate in UF terms and switched to more conventional nominal interest rate targeting—a change we shall call "nominalization" in the rest of the paper.

B. Summary Statistics for the Raw Data

Preliminary analysis of the data reveals some noteworthy similarities and differences between Chile and the other countries considered. Over this sample period, Chilean interest rates are on average higher, more volatile, and less persistent than the interest rates for the other countries. However, in Chile, the degree of co-movement between retail bank interest rates and the money market rate is essentially the same as in other countries. These "stylized facts" are highlighted in Tables 2 through 5, which report summary statistics for the interest series of all countries considered.

Chilean data display the highest *sample mean*, even in UF terms, while the Netherlands show the lowest average level of interest rates (Table 2). This may reflect the generally higher rate of inflation in Chile during most of our sample period, but could also reflect other factors, such as higher average risk premia or faster economic growth in Chile. In any case, it is not evident whether or how higher average interest rates per se might affect the pass-through.

Chilean data display the highest interest rate *volatility*, both for UF rates and for nominal rates, as measured by the sample standard deviation (Table 3). At all maturities, the interest rates for Canada, the United States, and Australia exhibit the lowest volatility. Higher volatility is usually

---

prime rate is a lending rate applied to the best borrowers. It usually moves immediately following policy announcements to signal banks' readiness to move their pricing schedule, but it does not necessarily move one-to-one with the policy rate. Therefore, it is not evident that pass-through should be complete in the long-run for prime rates.

[5] We do not use short-term deposit rates for Belgium, France, and the Netherlands, even though they are available, because they do not appear market-determined.

associated with higher uncertainty, which in turn may slow down agents' reaction to change by exacerbating precautionary behavior and increasing the option value of waiting.

Chile is the country in our sample with the lowest interest rate *persistence*. Again, this is true whether we look at UF rates or nominal rates (Table 4). Unlike all other countries, Chile's interest rate series appear also stationary. Over our sample period, the null hypothesis that Chilean interest rates have a unit root without drift can be rejected with 99 percent confidence for all rates except the nominal long-term deposit rate.[6] For most other countries, instead, this hypothesis cannot be rejected.

External shocks rather than policy are more likely to explain higher volatility and lower persistence in Chile than in other countries. On the one hand, the lesser persistence of interest rates in Chile may suggest that there have been periods during which the central bank was not willing to smooth rates to the same extent as some other central banks in the sample. As Figure 2 indicates, prior to the recent switch to nominal interest rate targeting, the UF money market rate – the old target rate – followed a fairly smooth pattern, except during the Asian and Russian financial crises.

On the other hand, it is also possible that the Chilean economy has simply been subject to larger and more frequent external shocks than in other countries during the whole sample period. For instance, Edwards (1998) emphasizes the role of external factors in explaining interest rate volatility in emerging economies. In addition, in the case of Chile, Caballero (2000) argues that the financial reforms the country has adopted in recent years may have produced speedier transmission of external shocks which in turn would imply greater measured volatility. Larger and more frequent external shocks than in other countries would naturally require more frequent adjustments of policy interest rates.

In any case, in all countries in our sample, retail banking interest rates exhibit a relatively high degree of contemporaneous correlation with the relevant money market rate (Table 5 and Figures 1 through 7). For Chile, in particular, the first principal component explains more than 90 percent of the variability of the 10 interest rate series considered, suggesting that a single common factor explains most of the co-movement of these data (results not reported).[7] The relatively high value of the simple correlation between the money market rate and retail bank rates also suggests that this common factor is most likely associated with domestic monetary policy.

---

[6] The regression includes a constant, a linear trend, and a variable number of lags between one and five. These results are not reported in the paper, but are available from the authors on request (as well as all other result not reported in the paper).

[7] Since we can reject the null hypothesis of unit root in the Chilean interest rate series, co-integration tests would not be informative on the degree of co-movement between the money market interest rate and retail bank rates.

Interestingly, Table 5 shows that the strength of this correlation tends to decline with the maturity of the retail rate in most countries. In addition, an analysis of the lagged autocorrelation between the money market interest rate and retail bank rate shows that for most of the countries considered, it is highest within the first month. However, for most of the countries in our sample, changes in money market rates do not seem to pass-through completely to retail banking rates, except for the United States, Canada, and Australia. In fact, money market rates appear more volatile than the retail rates.

In sum, a first look at the (unconditional) moments of the data suggests that there are both important similarities and differences between Chile and the group of other countries considered: Chilean interest rates comove with the policy rate as strongly as other countries, with the strength of this comovement decreasing with the maturity of the bank instrument analyzed. In addition, the volatility of the policy rate is slightly higher than the volatility of retail interest rates, as in most other countries. This indicates that policy and retail interest rates generally move very closely together, even though not all changes in the former are passed onto the latter. However, the average level and the volatility of Chilean interest rates is higher, while persistence is lower, than in other countries.

As we shall see in the next section, if the degree of (conditional) comovement between policy and retail interest rates is comparable across countries, then lower persistence in Chilean rates would be most likely due to higher volatility. It would follow that the key difference between Chile and other countries would be the greater interest rate volatility in Chile. On the other hand, as we pointed out in Section I, both interest rate volatility and market power in the banking system may affect the pass-through process. In the last section of the paper, therefore, we shall compare the pass-through across countries and try to investigate the relative role of volatility and market power in this process by using a simple aggregate dynamic, reduced form econometric model, which we now present.

III. The Econometric Model

In order to analyze the dynamic, reduced-form relation between retail banking interest rates and the money market rate, we first specify and estimate the following simple auto-regressive distributed lag (ADL) model:

$$(1) \qquad RtailR_t = \alpha_0 + \alpha_1 t + \alpha_2 MMR_t + \alpha_3 RtailR_{t-1} + \alpha_4 MMR_{t-1} \ .$$

Here *RtailR* is the relevant bank interest rate, *MMR* is the money market rate, and t is a time trend. The trend is intended to capture the disinflation process and other factors that change only slowly over time. (Examples may include financial market liberalization and other structural reforms.)

For all the countries considered, we specify equation (1) including only one lag of both the retail and the policy interest rate, here assumed to be exogenous—a reasonable assumption within the

month. For Chile, standard lag-length selection criteria over the entire sample period cannot reject this one-lag specification. This suggests that there is no serial autocorrelation in the residuals and thus no need to consider a higher order dynamic (results not reported). For the other countries, however, we impose this lag-structure a priori, without testing its adequacy, in order to assure full comparability with the Chilean specification.

When comparing time series models across countries, there is always a trade-off between the need to implement the comparison as neatly as possible and the need to fit models as best as possible to individual countries. By using different lags for different countries, we would run the risk to lose full comparability. By running the exercise with a common specification across countries we are running the risk of comparing Chile with other countries on the basis of a model that is possibly misspecified for other countries. In principle, one could try to determine the optimal lag-length for each interest rate series and country considered (a core set of about 60 regressions in our analysis!). We prefer a common parsimonious specification across all countries and interest rate series because it would be difficult, if not impossible, to uncover the "true" lag-length for all cases considered. Moreover, as the sample period is not very long, we would stand certainly to loose efficiency considering specifications with longer lag structures.

Following Hendry (1995), we then re-parameterize and re-estimate the ADL in (1) as the following error correction model (ECM):

$$(2) \qquad \Delta RtailR_t = \alpha_2 \, \Delta MMR_t + \beta_3 \, (RtailR_{t-1} - \beta_0 - \beta_1 \, t - \beta_2 \, MMR_{t-1})$$

where

$$(3) \qquad \beta_0 = \frac{\alpha_0}{(1-\alpha_3)}, \; \beta_1 = \frac{\alpha_1}{(1-\alpha_3)}, \; \beta_2 = \frac{\alpha_2 + \alpha_4}{(1-\alpha_3)}, \; \beta_3 = (\alpha_3 - 1) \; .$$

The parameters of equation (2) are linked to the parameters of equation (1) by equation (3). Hence, estimating the former equation allows all the parameters of the latter to be recovered and vice versa without altering the estimated residuals. From a statistical point of view, however, the two representations are not equivalent: if the series are stationary, or non-stationary but co-integrated, then the parameters of (2) may be estimated more efficiently because the error correction term and individual series represented in first differences are less likely to be collinear. If the series are integrated but do not co-integrate, then neither representation is statistically satisfactory.[8]

---

[8] As noted, all Chilean interest series are stationary, while most non-Chilean series appear to have a unit root. Therefore, in the case of Chile, it would be pointless to investigate the presence of co-integration between the money market and retail interest rates. For the other countries, we find that a standard ADF test on the estimated long-run relation ($RtailR - \beta_0 - \beta_1 t - \beta_2 MMR$) rejects the null of unit root in most cases. This suggests the presence of co-integration in the vast majority of the cases analyzed.

In equation (2), the term ($RtailR - \beta_0 - \beta_1 t - \beta_2 MMR$), the lagged deviation of the retail interest rate from its steady state value, can be interpreted as the solution of an optimization problem of a representative bank, as for instance in the model developed by Bondt (2000) and those reviewed by Freixas and Rochet (1998, Chapter 3). Nonetheless, since our empirical analysis is not tied to any particular structural model, we use equation (2) simply to characterize the dynamic, reduced form relation between retail and money market interest rates.

Our empirical results shall focus particularly on the degree of pass-through in the short term (α_2 , the size pass-through on impact and thus within a month), the degree of pass-through in the long run (β_2 , the size of the pass-through in the long run or in steady state), and the speed of adjustment to the long-run value (β_3) , which together with α_2 determine the average number of months needed to reach the long run of the pass-through ($1-\alpha_2 / \beta_3$, sometimes called the mean lag).

IV. Results

In this section, we report and discuss the estimation results. In the first subsection, we present a set of benchmark results for all the countries considered. In the second and third subsections, we check whether these results are robust across different states of the interest rate or monetary policy cycle and stable over time. We perform these robustness checks only for Chile. These tests are particularly interesting for Chile because they may help us interpret the small cross-country differences in pass-through that we detect in the benchmark results.

A. Is Chile's Interest Rate Pass-Through Atypical?

The benchmark set of estimation results reported in Table 6 suggests that, overall, Chile's interest rate pass-through is not atypical. In Chile, the pass-through appears incomplete even in the long-run, but this is also true for most European countries, New Zealand, and Australian deposit rates. [9] Pass-through appears complete only in the case of the Australian lending rate analyzed, Canada, and the United States. For Chile, however, the size of the short-term pass-through is larger than in Europe, Australia or New Zealand. As a result, the Chilean mean lag is markedly smaller than in Europe, and is comparable to that in the United States, Canada,

[9] The reported estimate for Europe is an average of the individual country estimates. As known in the literature on dynamic panel data models (e.g., Pesaran and Smith, 1995), such an average may yield a consistent estimate of the typical relation in the cross section. Indeed, its efficiency may be questioned in this case given the small number of country estimates available, but such an averaging is statistically legitimate and economically sensible.

Australia, and New Zealand. In fact, the mean lag for Chile is at most four months compared with a mean lag of at most two months for the United States and New Zealand. [10]

As one might expect, the shorter the maturity of the bank lending or deposit instrument, the larger and faster the pass-through. For given maturities, there appears to be only a small difference between deposit and loan rates. Moreover, in the case of Chile, we find little difference between the pass-through to UF and nominal interest rates.

Chile and Europe display slightly less than full pass-through, but the reasons appear different. In Chile, incomplete but relatively fast pass-through appears more likely to be due to external macroeconomic factors than to market power in the banking system, if we are willing to assume that lower persistence in interest rates is primarily due to external shocks. In the case of Europe, the existing literature points to some role for market power in the banking sector.[11] As we can see from equation (3), for a given size of the short-term pass-through $(\alpha_2 + \alpha_4)$, the size of the long-run pass-through (β_2) is an increasing function of the persistence parameter, α_3, which in turn is a decreasing function of interest rate volatility. Chile's long-run pass-through and the correlation between money market and retail interest rates is comparable to Europe's (Table 5 and 6). At the same time, the short-term pass-through is higher in Chile than in Europe, while interest rate persistence (and volatility) of both money market and retail interest rates is lower (higher) in Chile than in Europe (Table 4); thus reconciling differences and similarities noted in Section II as well as the econometric results reported here.

How to interpret these results? Chile has a financial structure in which domestic capital markets have played a progressively more important role over the last decade. In addition, the Chilean banking system is not only exposed to competition from domestic capital markets but also from foreign banks. As a result, the Chilean banks might have limited market power even if the banking system exhibits some degree of concentration—at least with regard to the largest borrowers that have access to both domestic and foreign capital markets.

This conjecture is not incompatible with some role for banks' behavior in the explanation of incomplete pass-through, but it de-emphasizes the role of market power to highlight the role of the relatively high degree of openness to trade in goods and assets of the Chilean economy. Domestic and foreign banks operate in a rather volatile external environment by international standards. As noted in Section II, it could be the case that bank intermediation is riskier in Chile

---

[10] It is worth pointing out that for short maturity interest rates in Chile, the mean lag is less than a month. It follows that one should not expect a statistically significant difference between the short run and the long run pass-through coefficient estimates.

[11] This interpretation is consistent with the observation of Cottarelli and Kourelis (1994) that reducing the fluctuations in money market rates could help enhance the size of pass-through, although they tie a reduction in the money market rate volatility to structural regulatory changes, rather than external shocks.

than in other economies (because of the more volatile external environment or other reasons). Indeed, banks' pricing decisions might be slowed down by such higher uncertainty. On the other hand, banks might also react promptly to monetary policy impulses, but external shocks force frequent and sometimes sharp policy changes in policy rates, resulting in a fast but less than full pass-through, on average. Either way, by affecting banks' behavior or interest rate persistence, external shocks-induced volatility might result in slower and more incomplete pass through than otherwise.

If incomplete pass-through were due mainly to market power in the banking system, one would expect that this would result in an asymmetric pass-through while analyzing periods of increasing and decreasing in interest rates. On the other hand, if external shocks were the main factor affecting pass-through incompleteness, one would expect to find evidence of a more complete pass-through before the Asian, Russian, Brazilian, and Argentine crisis that buffeted Chile after June 1997. Without pretense to be able to discriminate between these two competing hypothesis, based only on aggregate macroeconomic data, in the next two subsections, we shall try to assess the robustness of the benchmark estimation results presented here and their interpretation. We do so by investigating whether the Chilean pass-through is characterized by asymmetries across states of the interest rate cycle and/or instability over time.

B. Is Chile's Interest Rate Pass-Through Asymmetric?

To investigate this hypothesis, following Sarno and Thornton (2002), we create a dummy variable that is equal to one if the retail rate is above or equal to its long-run equilibrium level—given by the estimated error correction term $(RtailR - \beta_0 - \beta_1 t - \beta_2 MMR)$—and zero otherwise. We then re-estimate the model in (2) by interacting the coefficients α_2 and β_3 with this dummy.[12] As a result, we obtain estimates for the size of the short-term pass-through and its speed of adjustment in the two states of the interest rate cycle, which we shall call interest rate "tightening" and "easing," respectively.

Surprisingly, we find that there is little evidence of asymmetry in the pass-through for Chile when measured in this manner (Table 7). In most cases, either the estimates of the parameter of interest in one state are not statistically different from those the other state or the significant differences have the wrong sign.

The approach used by Sarno and Thornton (2002) to investigate these asymmetries does not take a stand on whether the deviations from the long-run equilibrium relationship are caused by changes in the stance of monetary policy or other temporary shocks. To explore the possibility that asymmetric behavior is more pronounced when the deviation from the long run equilibrium are associated with policy shocks, we experimented with a different dummy.

---

[12] Note that β_2 is kept constant in this exercise. Sarno and Thornton (2002) keeps also α_2 constant.

This variable tracks "tightening" and "easing" in the monetary policy stance more closely and is based on the publicly announced target for the money market interest rate (Figure 8).[13] Again, as we can see from Table 7, irrespective of the source of the deviation from the long run equilibrium, we find little evidence of asymmetry in the pass-through for Chile.

Hannan and Berger (1991) and Neuman and Sharpe (1992) found evidence of asymmetric pass-through for deposit rates in the United States and concluded that the most likely explanation could be banking market power. It might be possible to conclude, on the basis of their argument, that the lack of asymmetric pass-through for the Chilean banking system means absence of market power. However, this evidence cannot be conclusive. In fact, using bank level data, Bernstein and Fuentes (2002) do find evidence which they interpret as suggesting that market power may be present in some segments of the Chilean banking system.

C. Is Chile's Interest Rate Pass-Through Stable Over Time?

To determine whether Chile's interest rate pass-through has changed in recent years due to international crises, changes in the exchange rate regime, and, most recently, the nominalization of monetary policy, we follow Morande and Tapia (2002) by reestimating the model over three progressively longer samples: a sub-sample that excludes the Argentine crisis and the nominalization of monetary policy (so that it ends in June 2001), a sub-sample that excludes the whole free-floating period (this sample ends in June 1999), and a sub-sample that excludes the entire Asian-Russian financial crisis period (and subsequent periods, ending in June 1997). Table 8 reports the estimates of our parameters of interest, for Chile.

The evidence on parameter stability suggests that there might have been some slowdown in the pass-through in the post-1997 period. But there is less evidence that things have changed further after 1997. The estimates for interest rates *denominated in UF terms* based on the sample through June 1997, in particular, do appear to differ somewhat from those obtained on longer samples. Interestingly, these estimates display larger pass-through in the long-run than those based on longer sample periods.[14]

---

[13] This variable, called "forward" (backward) dummy in Figure 8, is equal one if the next (or previous) policy change is and interest rate target decrease. This approach is similar to the one used by Mojon (2000), who identifies interest rate cycles directly by inspecting plots of retail interest rates. We also considered the possibility of disentangling the impact of the banking structure on the pass-through by comparing the response of retail banking rates with that of market interest rates of similar maturities. However, data availability prevented us from carrying out this type of analysis.

[14] Note that those estimates of the long-run pass-through based on the shortest sample period appearing equal to zero result from an estimated α_4 of the equal size but opposite sign than α_2;

Summary statistics on the row data are consistent with this econometric evidence: as we can see from Table 2 the standard deviation of interest rates in UF terms through June 1997 is only about a third of that computed on longer sample periods, while persistence of the money market rate was about 25 percent higher. Thus, suggesting a break after mid-1997. The fact that the break occurred at the time of the Asian and Russian crises brings some support to the view that pass-through incompleteness, in the case of Chile, is more likely due to external shocks rather than market power in the banking system.

The changes in exchange rate and monetary policy regimes that took place in September 1999 and August 2001, respectively, do not appear to have had much impact on the interest rate pass-through over and above the impact of the external environment. The estimates based on the two sub-samples through June 2001 and June 1999 are essentially identical to that based on the entire sample period (through September 2002). In particular, though it might be early to assess the effects of nominalization of monetary policy, these results suggest that nominalization has had no significant impact on the interest rate pass-through.

Indeed, a standard stability test based on recursive OLS estimates from April 1997 onward, confirms the broad thrust of the these conclusions. As we can see from Figure 9, the estimated model display clear signs of parameter instability around the time of the Asian and Russian and only much weaker evidence of instability after mid-1999 and mid-2001.

V. Conclusions

In this paper, we have conducted an empirical analysis of the pass-through of changes in money market interest rates to retail banking deposit and lending interest rates. We have compared Chile with the United States, Canada, Australia, New Zealand, and five European countries.

Based on broadly comparable aggregate monthly data from 1993 to 2002 and an identical standard error-correction econometric specification, we have found that, overall, Chile's pass-through is not atypical. Although our results indicate that Chile's pass-through is incomplete in the long-run, the same holds for most of the other countries considered. Chilean interest rates are more volatile and less persistent than in many other countries. However, the pass-through in the short term is larger than in many of these countries. Chile's pass-through is also faster than in most other countries.

---

thus, annihilating the term $(\alpha_2 + \alpha_4)$ and hence also the long-term pass-through. These are cases in which a different, possibly even shorter, lag-length would likely be appropriate (say including only contemporaneous variables).

Slow and/or incomplete pass-through is usually attributed to market power in the banking system. This paper, however, suggests that external volatility should be considered more carefully as a possible factor giving rise to pass-through incompleteness in a small open economies. Indeed, we have argued that it is plausible that external volatility could be responsible for a fast but incomplete pass-through in Chile.

We find no significant evidence of asymmetric behavior across states of the interest rate cycle, regardless of the criterion used to identify different states of the cycle. On the other hand, we do find some evidence of parameter instability around the time of the Asian crisis. The pass-through mechanisms appear faster and more complete before June 1997 (i.e., before the Asian/Russian crises), especially for interest rates in UF terms. However, we showed that neither the switch to a fully flexible exchange rate regime in 1999 nor the adoption of nominal interest rate targeting in August 2001 seems to have affected pass-through markedly.

These results are consistent with the view that the differences between Chile and the other countries we have studied, if any, are due mainly to external shocks, rather than differences in market power in the banking system or the recent changes in Chile's exchange rate and monetary policy regimes. It would therefore be interesting to evaluate this hypothesis more rigorously on micro data based on the predictions of a banking sector model of imperfect competition in an open economy.

Table 1. Interest Rate Descriptions and Abbreviations

Country and type of rate	Abbreviation	Description
Chile		
Monetary Policy Rate	tpm	Monetary policy rate of the Central Bank, used for setting the interbank lending rate Real rate through July 2001, real rate is derived from nominal thereafter
Overnight Interbank Rate	mmrnom	Nominal money market rate: overnight interbank lending rate
	mmrrl	UF money market rate: overnight interbank lending rate adjusted by previous month's inflation
Deposit Rates	dstnom	Nominal deposit rate on commercial and consumer deposits of 30 to 89 days
	dmtnom	Nominal deposit rate on commercial and consumer deposits of 90 to 365 days
	dmtuf	Deposit rate on commercial and consumer deposits in UF of 90 to 365 days
	dltnom	Nominal deposit rate on commercial and consumer deposits of 1 to 3 years
	dltuf	Deposit rate on commercial and consumer deposits in UF of 1 to 3 years
Lending Rates	lstnom	Nominal lending rate on commercial and consumer loans of 30 to 89 days
	lmtnom	Nominal lending rate on commercial and consumer loans of 90 to 365 days
	lmtuf	Lending rate on commercial and consumer loans in UF of 90 to 365 days
	lltnom	Nominal lending rate on commercial and consumer loans of 1 to 3 years
	lltuf	Lending rate on commercial and consumer loans in UF of 1 to 3 years
	lwtnom	Weighted average interest rate on peso loans
	lwtuf	Weighted average interest rate on UF loans
United States		
Federal Funds Rate	mmrnom	Overnight interbank lending rate
Deposit Rates	dstnom	Average of dealer offering rates on nationally traded certificates of 1-month deposits
	dmtnom	Average of dealer offering rates on nationally traded certificates of 3-month deposits
	dltnom	Deposits of 9 to 12 months at the Federal Home Loan Bank of New York
Lending Rate	lstnom	Prime Lending Rate: overnight loans to businesses
Canada		
Overnight Interbank Rate	cammr	Overnight interbank lending rate
Deposit Rates	cdst	Thirty-day commercial certificates of deposit
	cdmt	Ninety-day commercial certificates of deposit
Lending Rates	clst	Prime business short-term lending rate
	clmt	One-year conventional mortgage rate
	cllt	Three-year conventional mortgage rate

Table 1 (cont.). Interest Rate Descriptions and Abbreviations

Country and type of rate	Abbreviation	Description
Belgium		
Overnight Interbank Rate	bmmr	Overnight Interbank Rate
Deposit Rates	bdst	Deposits of less than 3 months
	bdmt	Deposits, 3 mo - 1 yr
Lending Rates	blst	Commercial loans, 6 months
	blmt	Commercial loans, up to 1 year
	bllt	Commercial loans, 1 to 5 years
France		
Call Money Rate	fmmr	Call Money Rate
Deposit Rates	fdst	Deposits, up to 3 months
	fdlt	Deposits, 1 to 2 years
Lending Rates	flmt	Commercial loans up to 1 year
	fllt	Commercial loans over 1 year
Germany		
Overnight Interbank Rate	gmmr	Overnight Interbank Rate
Deposit Rates	gdst	Deposits, 1 to 3 months
	gdmt	Deposits, 3 months to 1 year
	gdlt	Deposits, over 3 months notice period
Lending Rates	glmt	Commercial loans up to 1 year
	gllt	Consumer loans greater than 1 year
Netherlands		
Overnight Interbank Rate	nmmr	Overnight interbank rate
Deposit Rates	ndst	Demand deposits
	ndlt	Deposits, 2 years
Lending Rate	nlmt	Commercial loans, up to 1 year
Spain		
Overnight Interbank Rate	smmr	Overnight interbank rate
Deposit Rates	sdst	Deposits, overnight
	sdlt	Deposits, 1 to 2 years
Lending Rates	slmt	Commercial loans, up to 1 year
	sllt	Commercial loans, 1 to 3 years
Australia		
Overnight Interbank Rate	atrb	Thirteen week treasury bill used due to irregularities in the money market rate.
Deposit Rates	adst	Three-month bank deposits
	admt	Six-month bank deposits
	adlt	One-year bank deposits
Lending Rate	alwt	Weighted average of all loans
New Zealand		
Overnight Interbank Rate	zmmr	Overnight interbank rate
Deposit Rates	zdst	Call deposit rate
	zdmt	Six-month bank deposits
Lending Rate	zlwt	Weighted average of all loans

Table 2. Sample Mean of Interest Rates, April 1993 - June 2002 1/

	mmr	dst	dmt	dlt	lst	lmt	llt	lwt
Chile (Nominal, Full Sample)	12.92	11.12	11.79	14.14	15.36	22.13	25.17	17.40
April 1993 - June 1997	16.33	14.05	14.61	16.43	18.12	25.50	28.60	18.11
April 1993 - June 1999	15.82	13.45	14.30	16.78	17.50	24.99	27.34	18.70
April 1993 - June 2001	14.10	12.09	12.76	15.33	16.35	23.13	26.15	17.90
Chile (U.F., Full Sample)	6.53	--	5.93	6.35	--	8.45	8.34	8.41
April 1993 - June 1997	6.85	--	6.43	6.75	--	9.08	8.93	8.84
April 1993 - June 1999	7.78	--	6.92	7.16	--	9.48	9.19	9.52
April 1993 - June 2001	7.08	--	6.42	6.80	--	8.92	8.70	8.79
United States	4.80	4.89	4.95	5.25	7.79	--	--	--
Canada	4.66	4.75	4.84	--	6.37	6.79	7.57	--
Belgium	4.28	3.33	3.62	--	5.18	8.14	6.95	--
France	4.45	3.53	--	4.58	--	6.34	6.38	--
Germany	4.10	3.06	3.52	3.71	--	8.52	11.61	--
Netherlands	3.94	0.58	--	3.90	--	4.43	--	--
Spain	6.02	3.38	--	4.92	--	7.01	8.59	--
Australia	5.61	4.41	4.79	5.33	--	--	--	9.12
New Zealand	6.66	4.44	6.59	--	--	--	--	10.55

Table 3. Sample Standard Deviation of Interest Rates, April 1993 - June 2002 1/

	mmr	dst	dmt	dlt	lst	lmt	llt	lwt
Chile (Nominal, Full Sample)	6.35	4.92	4.74	4.94	5.00	5.87	4.61	3.40
April 1993 - June 1997	5.64	4.28	3.48	3.15	4.55	5.08	4.01	2.73
April 1993 - June 1999	5.73	4.26	3.69	3.54	4.60	5.09	3.87	3.56
April 1993 - June 2001	6.00	4.57	4.31	4.15	4.61	5.63	4.17	3.38
Chile (U.F., Full Sample)	3.36	--	2.09	1.76	--	2.07	1.67	2.03
April 1993 - June 1997	0.50	--	0.45	0.39	--	0.42	0.53	0.41
April 1993 - June 1999	3.09	--	1.52	1.27	--	1.53	1.22	1.76
April 1993 - June 2001	2.98	--	1.64	1.36	--	1.70	1.43	1.87
United States	1.28	1.29	1.31	1.22	1.28	--	--	--
Canada	1.28	1.31	1.34	--	1.30	1.16	1.08	--
Belgium	1.64	0.97	1.31	--	1.25	1.42	1.11	--
France	1.59	0.63	--	1.49	--	1.67	1.69	--
Germany	1.25	0.93	1.00	0.87	--	0.99	1.39	--
Netherlands	1.19	0.11	--	0.84	--	1.21	--	--
Spain	2.66	1.54	--	2.35	--	2.67	2.80	--
Australia	1.13	1.06	1.20	1.31	--	--	--	1.28
New Zealand	1.80	1.51	1.45	--	--	--	--	1.33

1/ Data for Chile are through September 2002, except weighted average loans, which are from January 1995 through June 2002.

Table 4. Sample Persistence of Interest Rates, April 1993 - June 2002 1/

	mmr	dst	dmt	dlt	lst	lmt	llt	lwt
Autocorrelation of rate with rate at (t-1)								
Chile - Nominal, Full Sample	0.68	0.72	0.79	0.93	0.75	0.87	0.92	0.72
April 1993 - June 1997	0.47	0.50	0.52	0.94	0.62	0.79	0.87	0.65
April 1993 - June 1999	0.47	0.50	0.53	0.85	0.61	0.76	0.87	0.61
April 1993 - June 2001	0.61	0.65	0.73	0.89	0.69	0.85	0.90	0.68
Chile - U.F., Full Sample	0.64	--	0.88	0.92	--	0.87	0.87	0.87
April 1993 - June 1997	0.82	--	0.92	0.92	--	0.90	0.53	0.87
April 1993 - June 1999	0.54	--	0.82	0.84	--	0.76	0.75	0.76
April 1993 - June 2001	0.62	--	0.87	0.89	--	0.85	0.85	0.85
United States	0.99	0.98	0.99	0.98	0.99	--	--	--
Canada	0.96	0.96	0.97	--	0.97	0.95	0.93	--
Belgium	0.97	Administered Rate	0.98	--	0.97	0.97	0.97	--
France	0.97	Administered Rate	--	0.97	--	0.98	0.99	--
Germany	0.99	0.99	0.99	0.99	--	1.00	1.00	--
Netherlands	0.99	Administered Rate	--	0.98	--	0.99	--	--
Spain	0.99	1.00	--	1.00	--	0.99	1.00	--
Australia	0.98	1.00	0.99	0.98	--	--	--	0.99
New Zealand	0.96	0.98	0.98	--	--	--	--	0.97

Table 5. Sample Correlation of Interest Rates, April 1993 - June 2002 1/

	mmr	dst	dmt	dlt	lst	lmt	llt	lwt
Contemporaneous correlations with policy rate								
Chile (Nominal, Full Sample)	1.00	0.94	0.84	0.76	0.94	0.92	0.77	0.65
April 1993 - June 1997	1.00	0.91	0.70	0.61	0.93	0.89	0.69	0.87
April 1993 - June 1999	1.00	0.90	0.71	0.58	0.92	0.88	0.63	0.87
April 1993 - June 2001	1.00	0.93	0.80	0.70	0.93	0.91	0.71	0.87
Chile (U.F., Full Sample)	1.00	--	0.89	0.84	--	0.88	0.81	0.74
April 1993 - June 1997	1.00	--	0.88	0.72	--	0.80	0.33	0.91
April 1993 - June 1999	1.00	--	0.89	0.86	--	0.89	0.78	0.89
April 1993 - June 2001	1.00	--	0.90	0.87	--	0.90	0.81	0.91
United States	1.00	0.99	0.98	0.92	1.00	--	--	--
Canada	1.00	0.99	0.97	--	0.99	0.89	0.72	--
Belgium	1.00	Administered Rate	0.98	--	0.94	0.98	0.59	--
France	1.00	Administered Rate	--	0.99	--	0.84	0.88	--
Germany	1.00	0.99	0.99	0.96	--	0.97	0.83	--
Netherlands	1.00	Administered Rate	--	0.85	--	0.98	--	--
Spain	1.00	0.98	--	0.98	--	0.99	0.99	--
Australia	1.00	0.73	0.91	0.88	--	--	--	0.88
New Zealand	1.00	0.92	0.96	--	--	--	--	0.94

1/ Data for Chile are through September 2002, except weighted average loans, which are from January 1995 through June 2002.

Table 6. Retail Interest Rate Pass-Through, All Countries, April 1993 - June 2002

Retail bank rate	CHILE 1/			EURO 2/			CANADA			UNITED STATES			AUSTRALIA 3/			NEW ZEALAND		
	On Impact	Long-run	Mean lag	On Impact	Long-run	Mean lag	On Impact	Long-run	Mean lag	On Impact	Long-run	Mean lag	On Impact	Long-run	Mean lag	On Impact	Long-run	Mean lag
Nominal rates																		
Lending Rates																		
short-term	0.63	0.56	0.69	0.29	0.61	3.74	0.83	1.01	0.27	0.86	1.00	0.21	--	--	--	--	--	--
	(22.80)	(7.27)					(15.40)	(42.90)		(29.30)	(195.0)							
medium-term	0.58	0.88	2.10	0.43	0.82	3.23	0.63	0.51	2.47	--	--	--	--	--	--	--	--	--
	(25.10)	(6.24)					(7.23)	(2.38)										
long-term	0.18	0.55	1.95	0.18	0.57	11.34	0.46	0.24	4.15	--	--	--	--	--	--	--	--	--
	(6.38)	(5.84)					(4.67)	(0.94)										
weighted average	0.61	0.71	0.95	--	--	--	--	--	--	--	--	--	0.46	1.09	3.86	0.21	0.77	1.98
	(17.60)	(7.73)											(6.87)	(8.72)		(5.32)	(23.60)	
Deposit Rates																		
short-term	0.68	0.54	0.37	0.27	0.60	2.03	1.13	0.98	-0.15	1.00	1.00	0.00	0.40	0.67	1.43	0.34	0.74	2.13
	(25.50)	(11.40)					(18.40)	(55.20)		(12.4)	(57.5)		(8.08)	(26.80)		(11.10)	(22.10)	
medium-term	0.39	0.39	1.09	0.57	0.72	1.45	1.05	0.93	-0.09	0.84	0.93	2.00	0.69	0.87	0.66	0.42	0.71	2.32
	(9.78)	(4.09)					(10.70)	(22.70)		(9.57)	(12)		(13.20)	(37.40)		(9.72)	(13.30)	
long-term	0.20	0.68	4.21	0.40	0.63	17.38	--	--	--	0.87	0.64	0.87	0.87	0.81	1.00	--	--	--
	(6.31)	(3.39)								(6.60)	(3.31)		(11.90)	(5.13)				
UF rates																		
Lending Rates																		
weighted average	0.31	0.54	1.64	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	(14.70)	(11.60)																
medium-term	0.32	0.58	1.84	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	(15.90)	(12.10)																
long-term	0.21	0.45	1.52	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	(9.86)	(11.90)																
Deposit Rates																		
medium-term	0.31	0.57	2.16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	(13.20)	(9.21)																
long-term	0.19	0.55	4.26	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	(11.20)	(6.73)																

1/ Results for Chile are on data through September 2002, except weighted average loans, which are from January 1995 to June 2002.

2/ Simple average of results on available rates from Belgium, France, Germany, Netherlands, and Spain.

3/ Using 13-week Treasury Bill instead of Money Market Rate due to unit root in the latter.

Table 7. Chile: Retail Interest Rate Pass-Through Asymmetry

Retail bank rate	Baseline		Interest rate cycle				Monetary policy cycle (with forward expectations)				Monetary policy cycle (with backward expectations)			
			Easing		Tightening		Easing		Tightening		Easing		Tightening	
	On impact	Mean lag	On impact	Mean lag	On impact	Mean lag	On impact	Mean lag	On impact	Mean lag	On impact	Mean lag	On impact	Mean lag
Nominal rates														
Lending Rates														
short-term	0.63	0.67	0.58	1.24	0.69	0.38	same	same	same	same	same	same	same	same
	(22.80)		(1.45)		(13.80)		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
medium-term	0.58	2.10	same	same	same	same	0.55	2.89	0.65	1.18	same	same	same	same
	(25.10)		n.a.		n.a.		(-1.69)		(9.71)		n.a.		n.a.	
long-term	0.18	2.00	same	same	same	same	same	same	same	same	0.21	1.53	0.10	3.53
	(6.38)		n.a.		n.a.		n.a.	n.a.	n.a.	n.a.	(1.54)		(1.43)	
Deposit Rates														
short-term	0.68	0.37	0.62	0.61	0.76	0.24	same	same	same	same	same	same	same	same
	(25.50)		(1.47)		(12.30)		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
medium-term	0.39	1.09	0.23	1.33	0.54	0.80	same	same	same	same	same	same	same	same
	(9.78)		(3.90)		(9.64)		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
long-term	0.20	4.00	0.23	2.96	0.13	n.a.	0.16	3.82	0.34	3.00	same		same	
	(6.31)		(1.07)		(1.83)		(-1.25)		(2.44)		n.a.		n.a.	
UF rates														
Lending Rates														
medium-term	0.32	1.66	0.41	2.57	0.27	1.43	0.30	3.04	0.30	1.23	0.40	2.57	0.16	1.90
	(15.90)		(2.13)		(3.82)		(1.97)		(2.50)		(4.86)		(4.92)	
long-term	0.21	1.46	0.28	1.71	0.17	1.28	same	same	same	same	0.25	1.74	0.10	1.53
	(9.86)		(1.92)		(3.94)		n.a.	n.a.	n.a.	n.a.	(4.26)		(4.17)	
Deposit Rates														
medium-term	0.31	1.86	same	same	same	same	0.38	2.29	0.26	1.60	0.39	1.85	0.14	2.61
	(13.20)		n.a.		n.a.		(1.08)		(2.56)		(6.92)		(4.56)	
long-term	0.19	3.38	same	same	same	same	0.17	4.77	0.17	2.49	0.24	3.45	0.07	4.23
	(11.20)		n.a.		n.a.		(2.30)		(2.35)		(3.43)		(4.95)	

Table 8. Retail Interest Rate Pass-Through, Chile Various Sample Periods

	April 1993 - June 1997			April 1993 - June 1999			April 1993 - June 2001			April 1993 - Sept. 2002		
Retail bank rate	On impact	Long-run	Mean lag	On impact	Long-run	Mean lag	On impact	Long-run	Mean lag	On impact	Long-run	Mean lag
Nominal rates												
Lending Rates												
short-term	0.68	0.42	0.45	0.64	0.61	0.58	0.63	0.56	0.66	0.63	0.56	0.69
	(17.73)	(2.62)		(19.8)	(8.26)		(21.3)	(6.86)		(22.80)	(7.27)	
medium-term	0.54	0.51	7.67	0.57	0.84	2.39	0.58	0.88	2.21	0.58	0.88	2.10
	(18.11)	(6.84)		(17.36)	(4.66)		(23.83)	(5.86)		(25.10)	(6.24)	
long-term	0.18	0.44	1.64	0.18	0.57	1.78	0.18	0.57	2.00	0.18	0.55	1.95
	(4.83)	(5.41)		(5.16)	(6.36)		(6.04)	(5.42)		(6.38)	(5.84)	
Deposit Rates												
short-term	0.75	0.45	0.24	0.68	0.53	0.37	0.68	0.53	0.37	0.68	0.54	0.37
	(19.76)	(4.73)		(13.4)	(8.96)		(23.74)	(10.50)		(25.50)	(11.40)	
medium-term	0.45	0.06	0.95	0.40	0.38	1.02	0.39	0.38	1.07	0.39	0.39	1.09
	(8.34)	(0.33)		(5.32)	(3.69)		(9.06)	(3.78)		(9.78)	(4.09)	
long-term	0.98	0.07	0.04	0.19	0.62	4.26	0.20	0.62	3.81	0.20	0.68	4.21
	(3.24)	(0.45)		(3.92)	(3.22)		(5.91)	(3.32)		(6.31)	(3.39)	
UF rates												
Lending Rates												
medium-term	0.34	0.77	2.00	0.34	0.59	1.06	0.34	0.60	1.08	0.32	0.58	1.84
	(4.87)	(8.53)		(3.87)	(15.10)		(18.10)	(21.00)		(15.90)	(12.10)	
long-term	0.26	0.50	0.84	0.21	0.48	1.18	0.21	0.48	1.20	0.21	0.45	1.52
	(1.58)	(4.57)		(3.54)	(11.60)		(10.50)	(15.70)		(9.86)	(11.90)	
Deposit Rates												
medium-term	0.30	0.83	6.36	0.29	0.57	1.37	0.29	0.60	1.42	0.31	0.57	2.16
	(4.02)	(5.20)		(3.9)	(15.10)		(16.48)	(20.10)		(13.20)	(9.21)	
long-term	0.23	0.07	5.92	0.23	0.48	1.60	0.22	0.50	2.05	0.19	0.55	4.26
	(2.99)	(0.10)		(4.31)	(12.8)		(12.80)	(13.80)		(11.20)	(6.73)	

Figure 1. Short-term deposit rates and money market rates, 1993 - 2002

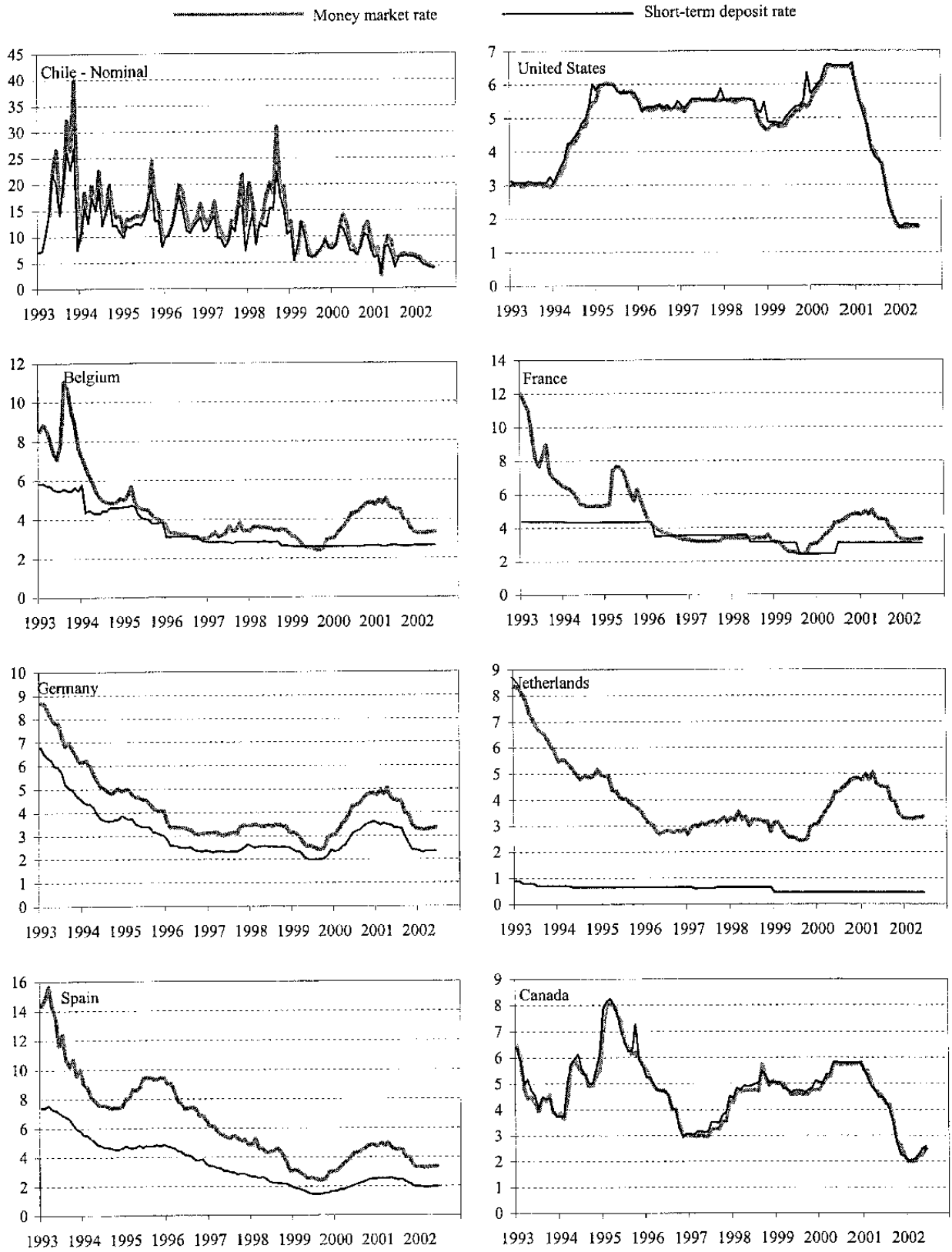
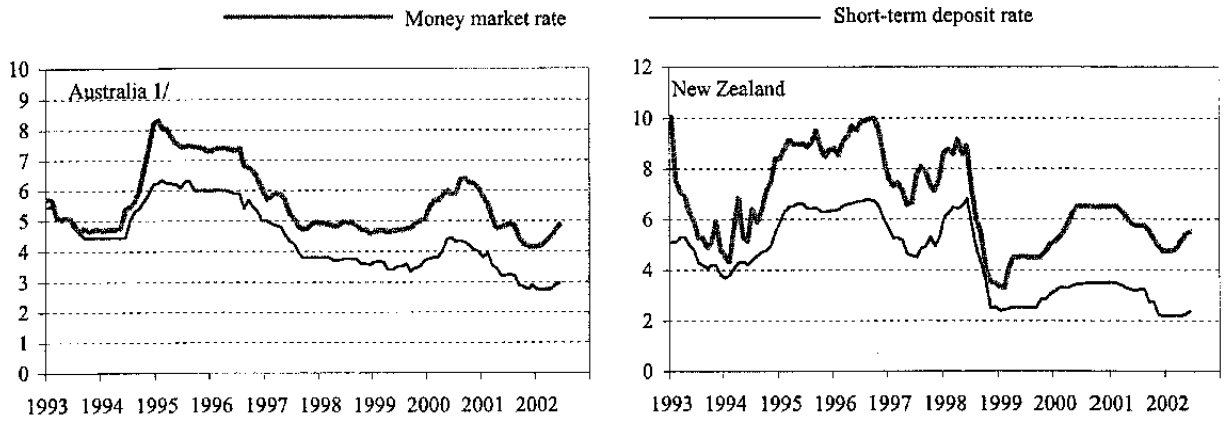
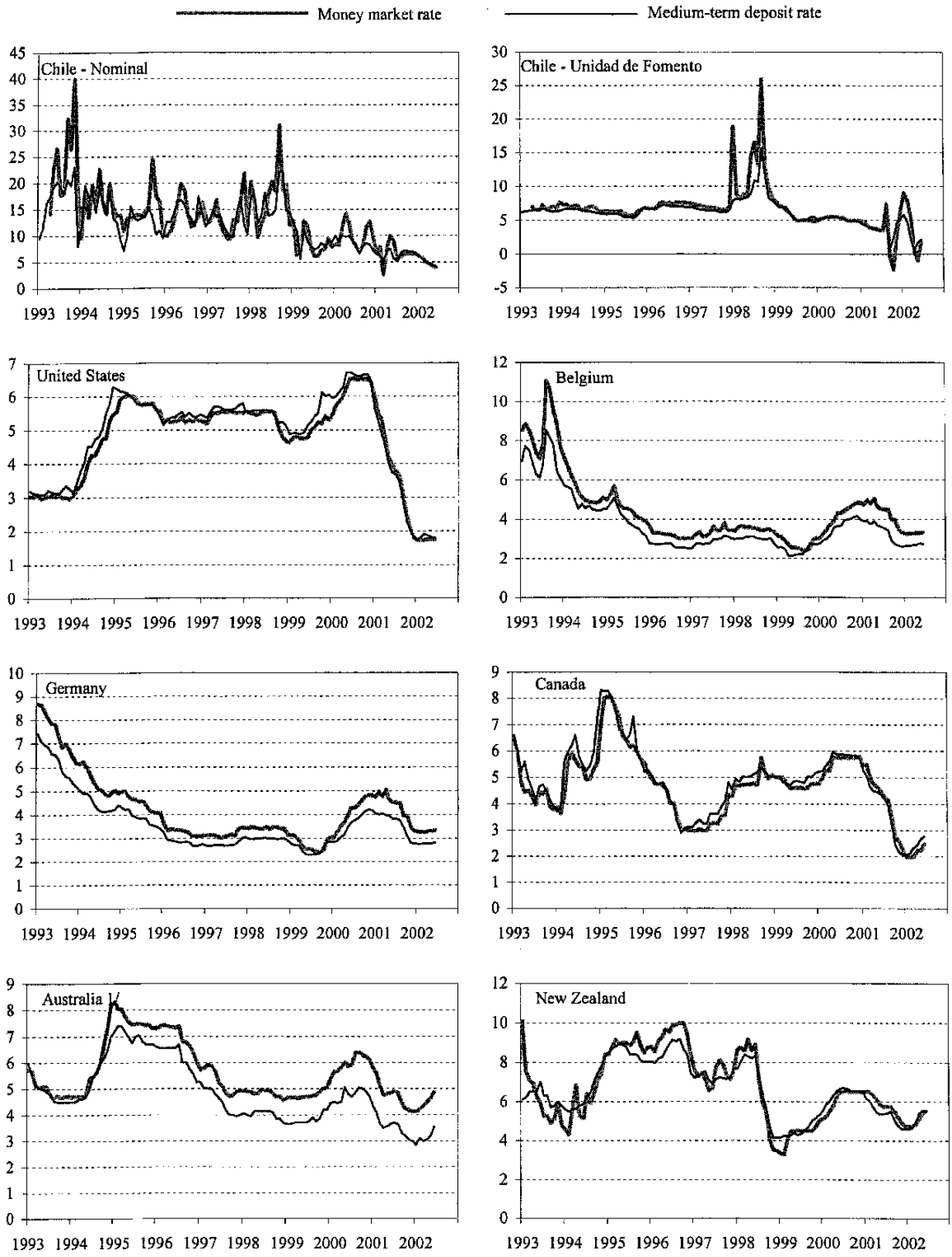


Figure 1a. Short-term deposit rates and money market rates, 1993 - 2002



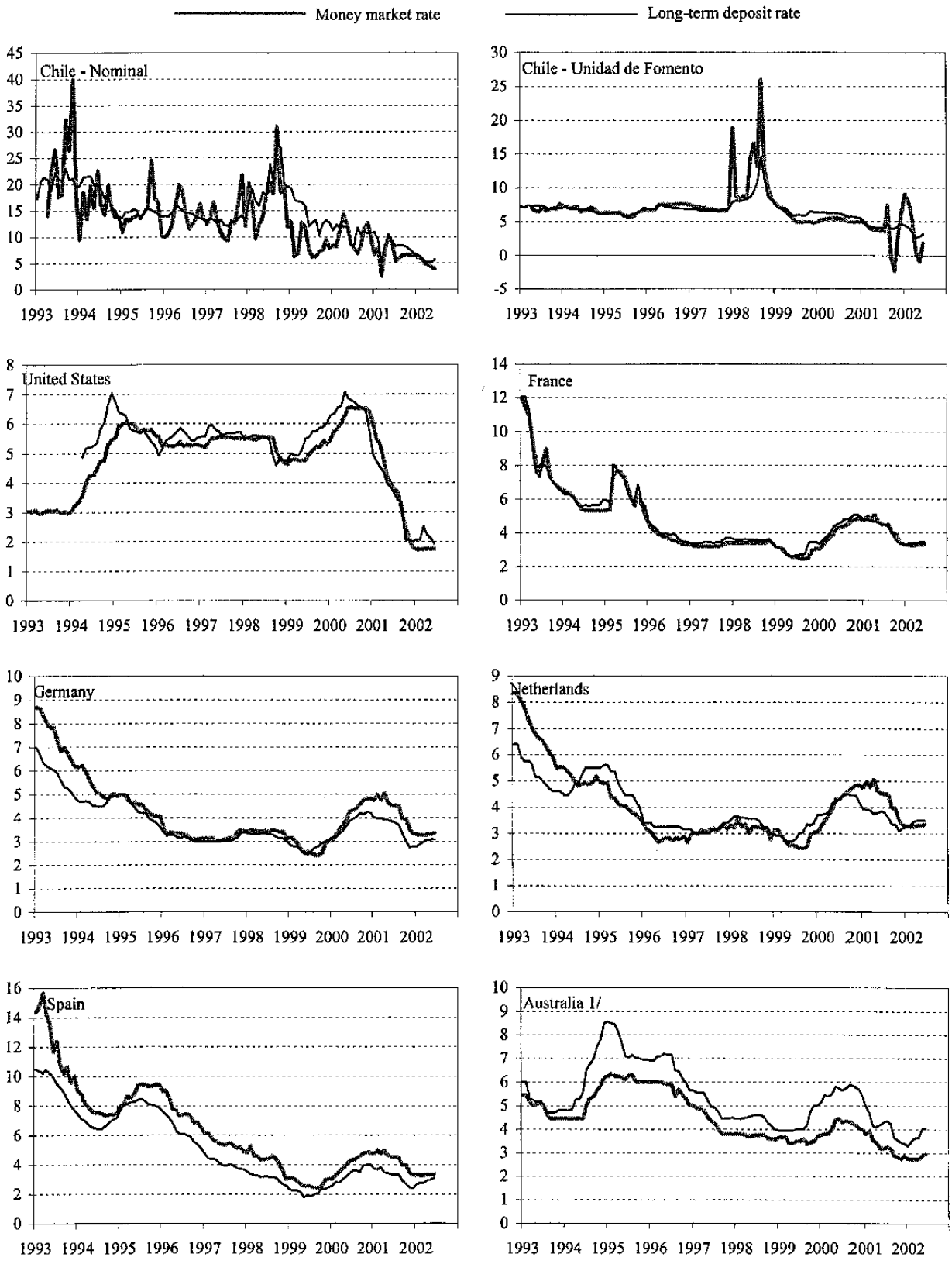
1/ Money market rate is replaced by 13-week treasury bill.

Figure 2. Medium-term deposit rates and money market rates, 1993 - 2002



1/ Money market rate is replaced by 13-week treasury bill.

Figure 3. Long-term deposit rates and money market rates, 1993 - 2002



1/ Money market rate is replaced by 13-week treasury bill.

Figure 4. Short-term lending rates and money market rates, 1993 - 2002

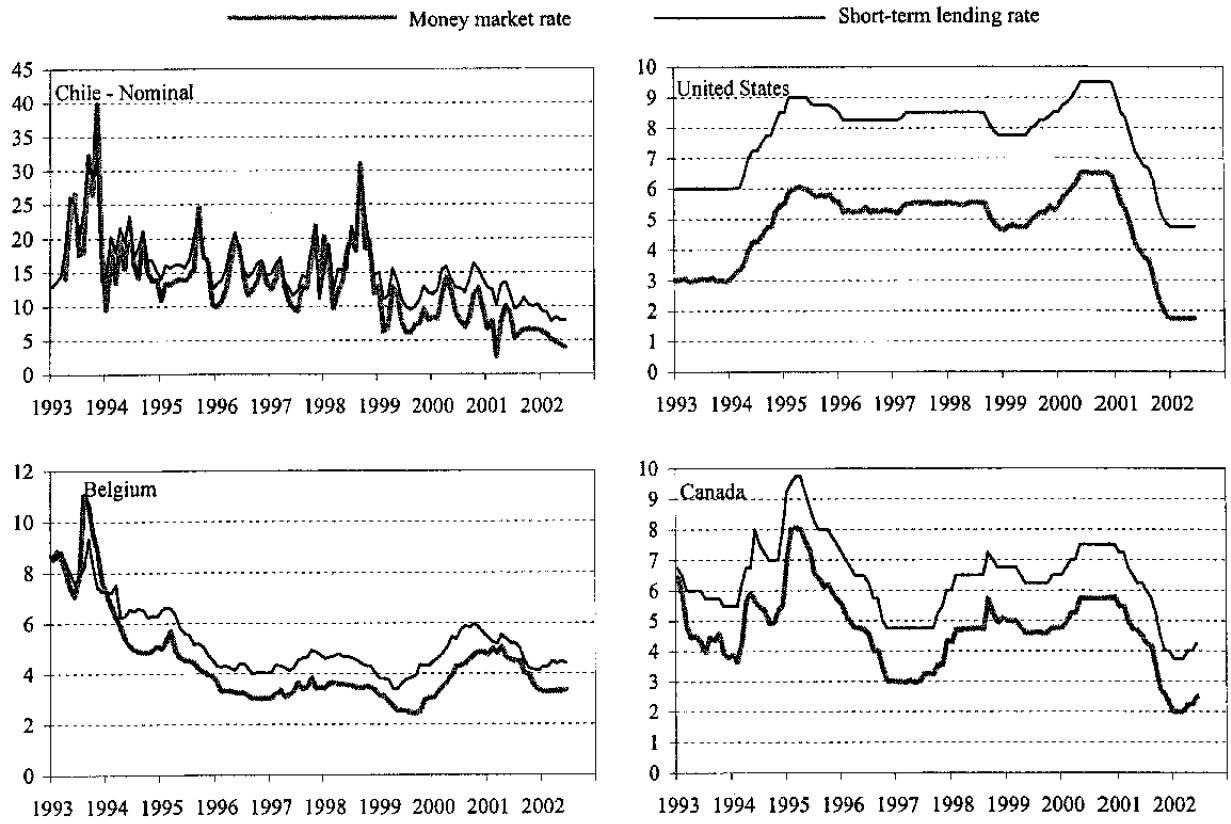


Figure 5. Medium-term lending rates and money market rates, 1993 - 2002

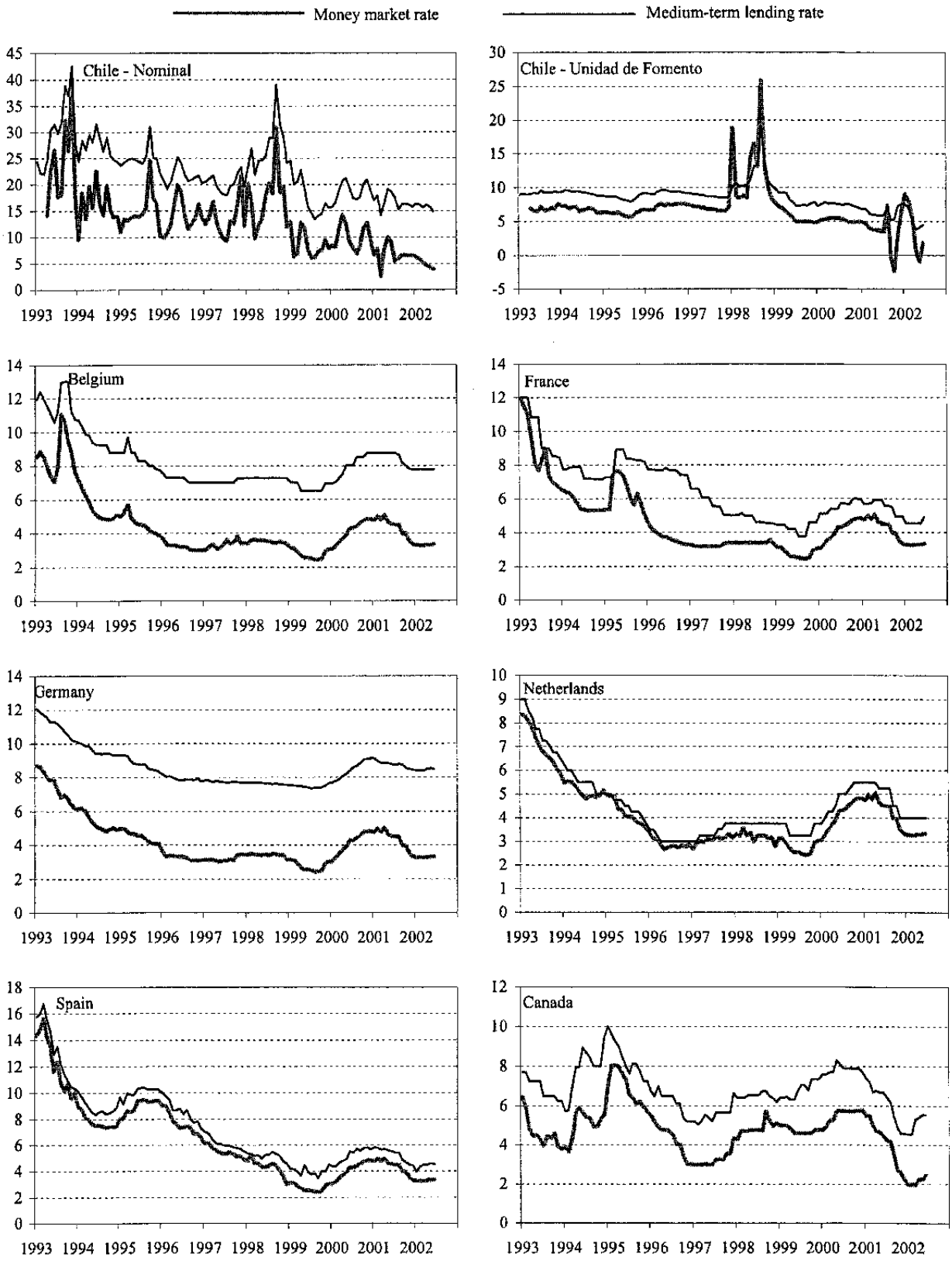


Figure 6. Long-term lending rates and money market rates, 1993 - 2002

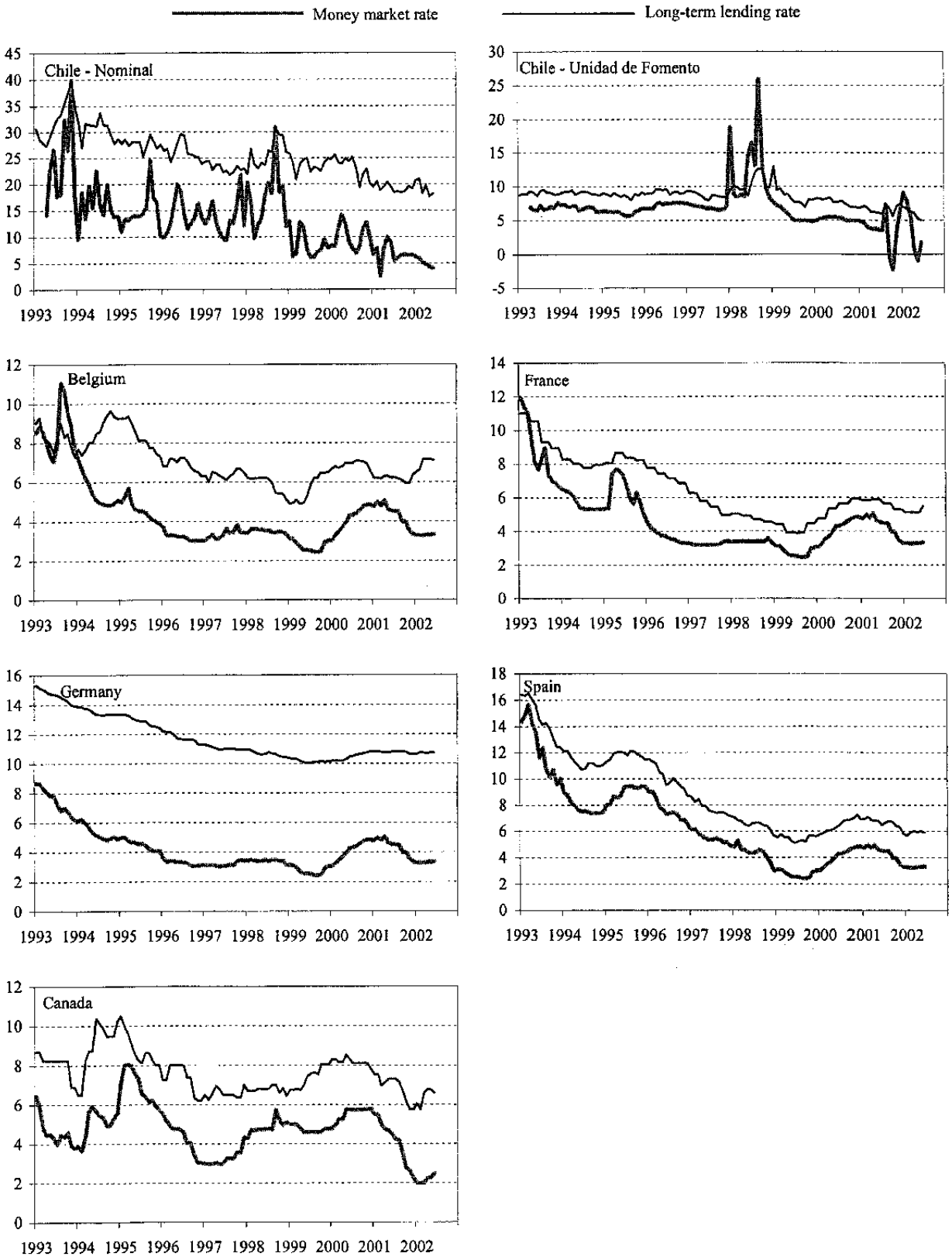
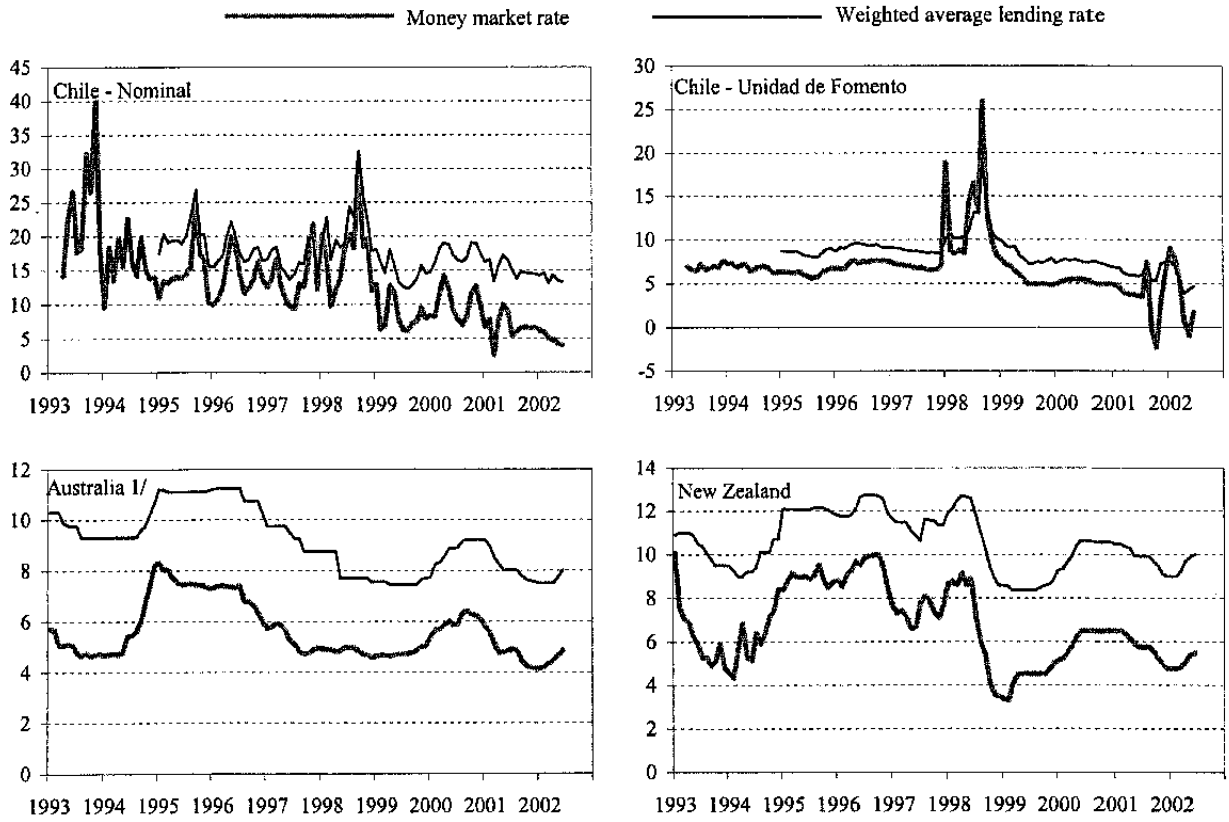
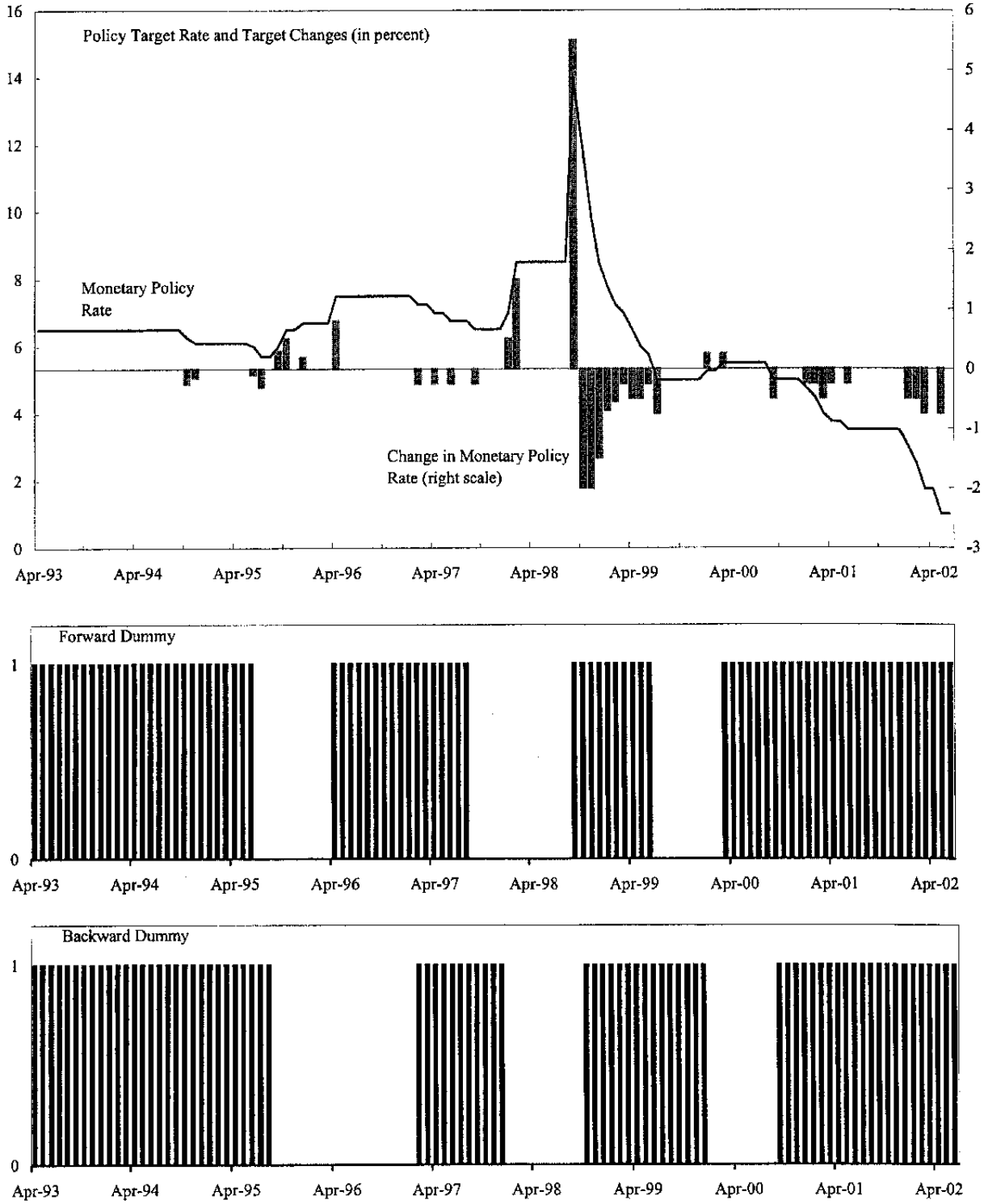


Figure 7. Weighted average lending rates and money market rates, 1993 - 2002



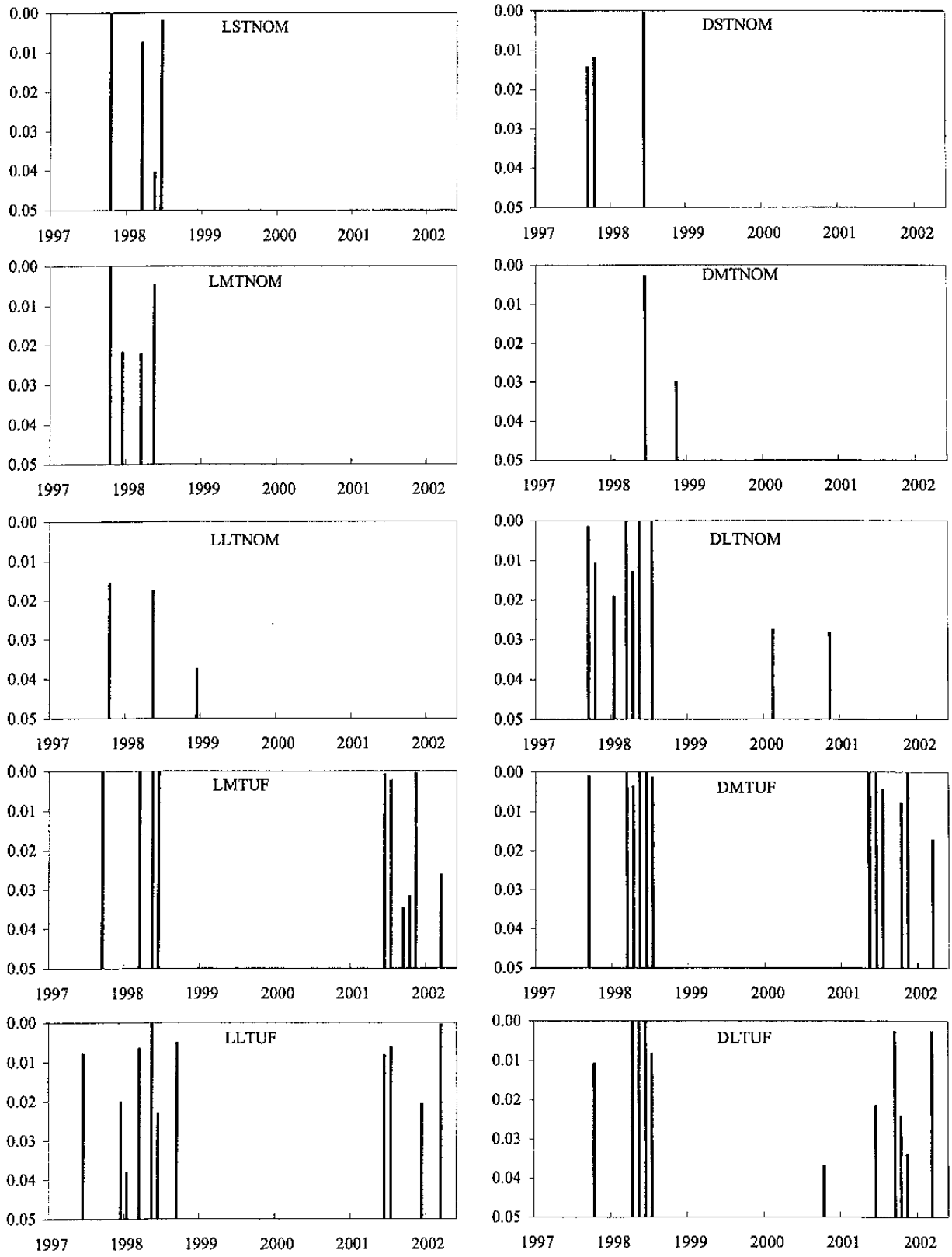
1/ Money market rate is replaced by 13-week treasury bill.

Figure 8. Chile: Timing of the Monetary Policy Cycle, 1993 - 2002



Sources: Central Bank of Chile and IMF staff estimates.

Figure 9. Chile: One-Step Chow Test, 1993 - 2002 1/



Source: IMF staff estimates

1/ P-values less than 0.05 (i.e., greater than 95 percent significance). The null hypothesis is parameter stability.

References

Bernanke, B., and Mark Gertler, 1995, "Inside the Black Box: The Credit Channel of Monetary Policy Transmission," *Journal of Economic Perspectives*, Vol. 9, pp. 27-48.

Bernanke, B., and S. Gilchrist, 1999, "The Financial Accelerator in a Quantitative Business Cycle Framework," in M. Woodford and J. Taylor (eds.), *Handbook of Macroeconomics*, Chapter 21.

Berstein S., and R. Fuentes, 2002, "From Policy Rate to Bank Lending Rates: the Chilean Banking Industry," Paper presented at the Sixth Annual Conference of the Central Bank of Chile, December.

Bondt, G., 2002, "Retail Bank Interest Rate Pass-Through: New Evidence at the Euro Area Level," Working Paper (Frankfurt: European Central Bank).

Borio, C., and W. Fritz, 1995, "The Response of Short-Term Bank Lending Rates to Policy Rates: A Cross-Country Perspective," in *Financial Structure and the Monetary Transmission Mechanism*, (Basel: Bank for International Settlements).

Caballero, Ricardo J., 2000, "Macroeconomic Volatility in Latin America: A View and Three Case Studies," NBER Working Paper No. 7782 (Cambridge, Massachusetts: National Bureau of Economic Research).

Cottarelli, C., and A. Kourelis, 1994, "Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy," *IMF Staff Papers*, Vol. 41, No. 4, pp. 587-623.

Edwards, Sebastian, 1998, "Interest Rate Volatility, Capital Controls and Contagion," NBER Working Paper No. 6756 (Cambridge, Massachusetts: National Bureau of Economic Research).

Hannan, T., and A. Berger, 1991, "The Rigidity of Prices: Evidence from the Banking Industry," *American Economic Review* Vo. 81, pp. 938-45.

Morande F., and M. Tapia, 2002, "Exchange Rate Policy in Chile: From the Band to Floating and Beyond," Central Bank of Chile Working Paper No. 152.

Mojon, B., 2000, "Financial Structure and the Interest Rate Channel of the ECB Monetary Policy," ECB Working Paper No. 40 (Frankfurt: European Central Bank).

Neuman, D., and S. Sharpe, 1992, "Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits," *Quarterly Journal of Economics*, pp. 657-680.

Sarno, L., and D. Thornton, 2002, "The Dynamic Relationship Between the Federal Funds Rate and the Treasury Bill Rate: An Empirical Investigation," *Journal of Banking and Finance* 666, forthcoming (2002).