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The Benefits and Costs of Official Dollarization for Argentina

Alfredo Schclarek Curutchet

<http://www.student.lu.se/~nek99scs>

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Supervisor: Anders Danielson

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Abstract

The economic benefits and costs of official dollarization for Argentina are analyzed. Probable advantages include an increase in investment flows from the U.S., a reduction in the real interest rate and its volatility, the elimination of the risk that currency mismatches causes financial fragility in the future, and a reduction in the financial fragility of debtors caused by maturity mismatches. One cost is the losing of the “exit option” in the future, and therefore the ability to devalue the peso against the U.S. dollar. Argentina may also lose the ability to collect seigniorage revenue, which will be collected by the U.S. The estimated present discounted value of the seigniorage revenue assume values such as USD 33,284 million (or 11.7% of nominal GDP), USD 99,190 million (34.8% of GDP), and USD 312,436 million (109.6% of GDP) depending on the assumptions made.

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1. Introduction

Since the second half of the 1990's different financial crises, such as the "Tequila" crisis (Mexico), the East Asian crisis, the Russian crisis and the Brazilian crisis, have hit the whole world and especially the emerging markets. These crises have not only affected the countries where the crises started but have had contagion effects on other emerging markets causing currency and banking crises in those countries too. The fact that these recent financial crises have not only spread to countries with fiscal and monetary problems but has also hit countries which follows macroeconomic orthodox recipes have lead economists to point out that these crises are not a consequence of bad managed domestic policies but are due to inherently volatile international financial flows. Therefore the debate has recently shifted from linking currency crises to deteriorating economic fundamentals to finding effective ways of stabilizing the volatility of international capital flows and avoiding contagion effects. Among the alternative ways of preventing volatility of international capital flows there has been suggestion ranging from implementing capital controls to implementing alternative exchange arrangements. The debate on the alternative exchange arrangements has varied from suggesting floating the exchange rate, fixing the exchange rate, creating new regional currencies or adopting a strong supranational currency as a mean of insulating from continent jumping financial contagion and currency crises. The adoption of a strong supranational currency has been called official dollarization.

The purpose of this paper is to assess which are the economic benefits and costs of official dollarization for Argentina. In order to do so a theoretical framework for the benefits and costs, mainly based on Stein et al., 1999, is analyzed. From this literature, one can identify two main groups of benefits, namely the benefits associated with the reduction of transactions costs and the benefits associated with the credible anchoring of the exchange rate to a credible currency. However, official dollarization also brings about the cost of losing the monetary policy independence. In the case of Argentina, the main macroeconomic developments and structural characteristics are analyzed for the period since the implementation of the Convertibility regime. These particular characteristics have as a result that not all of the theoretical benefits and costs will affect Argentina in the case it decided to officially dollarize its economy. The objective is then to analyze and identify which of these theoretical benefits and costs are relevant to the particular case of Argentina. It is important to

point out that the objective of this paper is not to quantify these benefits and costs or answer if Argentina should abandon the Peso for the U.S. dollar.

Another aim of this paper is to theoretically discuss some issues that arise when a country decides to implement official dollarization. There are mainly two issues of implementation, namely the loss of the ability to collect seigniorage revenue and the loss of the central bank's ability to print money for lender of last resort functions. In the case of Argentina, the present discounted value of the seigniorage revenue is estimated for several alternative scenarios. Also the yearly seigniorage revenue during the period 1993 to 2000 is estimated.

The remainder of the paper is organized in seven sections. Section 2 defines official dollarization and other relevant concepts. In Section 3, the theoretical benefits and costs of official dollarization are discussed. The issues of implementation for official dollarization are discussed in Section 4. In Section 5 the Convertibility plan is presented and its main economic consequences for Argentina are described. Section 6 discusses the theoretical benefits and costs of official dollarization for Argentina and points out which are the relevant ones when assessing the convenience of dollarizing the Argentine economy. In section 7, some estimates on the seigniorage revenue for Argentina between 1993 and 2000 are presented. Also the estimated present discounted value of the seigniorage revenue for Argentina is presented for several alternative scenarios. Finally, Section 8 concludes.

2. Definition of Official Dollarization

There are several definitions that should be considered in order to understand what dollarization implies. A country is partially dollarized or unofficially dollarized when the dollar is used, alongside the national currency, as any of the three classical roles of money, i.e. as a unit of account, means of payments, or store of value (Calvo, 1999). For example, the dollar is widely used as a unit of account and means of payment in private financial transactions in many countries. Moreover, opening dollar denominated bank accounts might even be legal. However, partial dollarization does not only mean dollar denominated deposits. In fact, it could also refer to cases of holding foreign-currency bonds or other non-cash assets, holding foreign-currency cash, whether the possession is legal or illegal, or holding foreign-currency deposits in foreign banks. Furthermore, the case of partial dollarization is not only

limited to partial dollarization on the asset side but also on the liability side (e.g. dollar denominated debt, dollar denominated T-bills, etc). Calvo (1999) calls partial dollarization on the liability side for liability dollarization.

Whether one or more of these forms of partial dollarization characterizes a country, depends on issues regarding economic, legal, and institutional factors. Furthermore, partial dollarization is not a phenomenon limited only to less-developed countries. Although at a moderate level, many industrialized countries, such as Greece or the United Kingdom, are considered to be partially dollarized (Bogetic, 1999).

Differently, the situation of official dollarization¹ or full dollarization is the case when a country completely abandons the use of the national currency and adopts the dollar² as the official currency. In a sense it can be compared to the adoption of a fixed exchange regime, however it is a more extreme case as it implies the total disappearance of the domestic currency. The complete abolition of the local currency gives dollarization a more permanent character than a fixed exchange regime, where some scope to exit the peg still exist. Although it is also true that a future reintroduction of the local currency would be possible after dollarization, it would imply a much more lengthy and complex process. This issue will be further discussed below when the different ways dollarization can be implemented are presented.

Dollarization can also be compared to a monetary union, like the EMU, but again there are certain differences. These differences can be more clearly understood by analyzing what a monetary union implies. In a monetary union, the participating countries agrees to maintain a fixed or managed exchange rate regime by delegating responsibility to a central organization to coordinate monetary policy (Schaefer, 1995). Normally, the economic size and stability of one or two member countries allows the monetary union to base the exchange rate levels in relation to the exchange rate of these dominant countries, giving them the status of anchor currencies. There are two main characteristics that are crucial for understanding how a monetary union works. Firstly, the economically dominant country surrenders control over domestic monetary policy in favor of the monetary union. Secondly, a new organization is established to act as a central bank for the monetary union. With this definition of monetary union in mind, and especially considering the two main characteristics mentioned above, it is

¹ In the rest of the paper, the term dollarization will be used instead of official dollarization.

² It is important to remark that the word dollarization is being used because it is being assumed that the country substitutes the national currency for the dollar, but the foreign currency could be any other, such as the Euro or the Yen. Furthermore, it could be the case that the country adopted more than one foreign currency as legal tender.

easier to understand the differences between a monetary union and dollarization. Firstly, the owner of the anchor currency, in this case the Fed, would not surrender its monetary policy independence to the dollarized country. Furthermore, the special situation of the dollarized country would not necessarily be taken into account when designing monetary policy. In fact, usually what is intended with dollarization is exactly adopting the current monetary policy so as to gain price stability or enhanced credibility. Secondly, dollarization would not imply the creation of a new monetary authority. The Fed would continue being the exclusive monetary authority in charge of designing and implementing monetary policies for the dollar. But keeping this monopoly would not prevent it from setting up arrangements and establishing treaties with dollarized countries.

As already anticipated, there are several ways a country can fulfill dollarization. However, these alternatives can be classified into two broad groups, namely a) unilateral decision, and b) bilateral agreement. Unilateral dollarization refers to the situation where the U.S. dollar is adopted unilaterally without any formal recognition or engagement of significance by the U.S. government. Conversely, bilateral agreement means pursuing dollarization by making a treaty with the U.S. which specifies the conditions of the agreement, such as the sharing of the seigniorage revenue, the access to the Fed discount window, and/or the voting rights on the Federal Open Market Committee (FOMC). A bilateral agreement would be an intermediate measure between a unilateral dollarization and a monetary union.

Unilateral dollarization has the advantage that it can be implemented immediately without a government having to spend any time in negotiations and/or agreements with the U.S. government. On the other hand, bilateral dollarization may imply a long and costly period of negotiations with the U.S. government and the Federal Reserve (Fed). However, unilateral dollarization has the disadvantage that there would not be any formal agreement with the U.S. Thus, many of the advantages of bilateral dollarization would be lost, such as the sharing of seigniorage revenue, the access to the Fed discount window and/or the voting rights on the FOMC. More will be discussed about the seigniorage revenue and the lender of last resort issue in Section 4 when the issues of implementation are analyzed. Another very important benefit of a treaty with the U.S. government or the Fed is that it increases the credibility of the measure. The increased credibility of a bilateral dollarization is the consequence of it having a more permanent character than a unilateral dollarization. While reverting unilateral dollarization would require changing laws, convincing the public to adopt the new currency and/or reestablishing its own central bank, bilateral dollarization would also

require changing any agreement or treaty with the U.S. Thus, bilateral dollarization enhances the costs of reversing the measure and has a more permanent character.

Reality shows that only a relatively small number of countries (independent nations and dependencies) have officially adopted a foreign currency as legal tender. The reasons include the political symbolism of a national currency, historical patterns of use of domestic and foreign currency, and economic factors such as the perceived costs of dollarization, primarily in terms of the loss of independent monetary and exchange policies, seigniorage revenue and domestic lender of last resort. Despite these apparent shortcomings, there are still some examples of dollarized countries. These include Andorra, Liechtenstein, Monaco, Panama, San Marino, Vatican City, Kiribati, Micronesia and Marshall Islands (Bogetic, 1999). Moreover, Ecuador has recently dollarized its economy and will therefore probably be a showcase in future discussions on dollarization.

3. Benefits and Costs of Dollarization

The convenience or feasibility of dollarization can be best assessed by a cost/benefit analysis (Stein et al., 1999). By taking into account the literature that discusses the relative merits of fixed vs. flexible exchange regimes, a cost/benefit analysis can be done for dollarization. However, it must always be remembered that dollarization has a more extreme and permanent character than a fixed exchange regime. These special characteristics will give dollarization some special and unique qualities when analyzing its advantages and disadvantages.

A fixed exchange rate implies that the local currency is exchanged at a fixed rate respect to another currency. Consequently, implementing a fixed exchange regime hamper the government to use the exchange rate as an economic policy instrument and reduces the scope for conducting independent monetary policies. Accordingly, choosing the identifiable standard and the level at which the exchange rate will be maintained are critical for a successful and effective fixed exchange regime. Clearly, a fixed exchange regime works well when participating countries have common economic goals with respect to economic growth and price levels. In such cases, fixed exchange regimes impose a common discipline ideal for dealing with monetary shocks, such as unusual credit expansion; global economic disturbances, such as an oil price rise; or economic disturbances from countries outside the exchange rate regime (Schaefer, 1995). Moreover, fixed regimes are also appealing for

countries with a strong need to import monetary stability due to either a history of hyperinflation, an absence of credible public institutions, or unusually large exposure to nervous investors (Frenkel, 1999). On the other hand, fixed exchange regimes do not work well when one or several participating countries have widely different domestic economic characteristics, pursue conflicting economic policies, or embark upon conflicting economic objectives. Tying a country to the economic conditions of other participants will cause the burden of readjustments to fall on the domestic economy with possible severe consequences to domestic wages, interest rates, price levels and economic output (Schaefer, 1995).

Clearly, fixed exchange regimes have two main benefits. Firstly, they reduce transaction costs related to trade and investment flows between the countries that are involved in the fixed regime. Secondly, they provide a nominal anchor to the exchange rate, which reduces governments' ability to use the exchange rate in a discretionary way. But there are also costs for countries adopting fixed exchange rate regimes, namely the loss of exchange rate determination and consequently the loss of monetary policy independence (Stein et al., 1999).

Dollarization has the same benefits and costs as a fixed exchange regime but its special characteristics enhance both the benefits and costs. Dollarization's special characteristics are a consequence of both the permanent character of the measure and the enhanced credibility derived from the adoption of a currency issued from a trustworthy monetary authority³. It is also important to note that the significance of the benefits and costs will not be the same for all countries. Their magnitude will depend on each country's special characteristics as well as their relation with the U.S. and other dollarized countries. This remark is especially true for countries which already are partially dollarized⁴. The issue of partial dollarization is many times overlooked or underestimated. However, for countries which already are partially dollarized, dollarization will both enhance the benefits associated with the reduction of governments' ability to generate inflationary surprises and reduce the cost associated with the loss of monetary policy independence. The magnitude of the benefits and costs will even depend on how dollarization was implemented. As seen in Section 2, the credibility and permanent character of dollarization vary depending on whether it is a unilateral decision or a result of a treaty with the U.S. An increased credibility and permanent character will mainly increase the benefits associated with the reduction of governments'

³ Here it is implicitly being assumed that the issuer of the anchor currency, the Fed, is a trustworthy monetary authority.

⁴ For a discussion of partial dollarization in different countries, see Baliño et al. (1999).

ability to generate inflationary surprises and increase the costs associated with monetary independence loss.

The benefits associated with the reduction of transaction costs

One of the consequences of fixing the exchange rate is the reduction of exchange risks associated with exchange rate volatility. Although exchange risks are reduced in a fixed exchange regime, a certain exchange risk will always remain due to the fact that the fixed exchange rate might be abandoned in the future. It is important to note here that exchange rate variability will have a negative impact only if the risk generated by unstable exchange rates cannot be hedged or at least priced in efficient financial market. However, it is also reasonable to think that the cost for hedging will be expensive when one of the countries has a weak currency. It might even be the case that no hedging mechanism exists for certain underdeveloped countries with very weak currencies. Conversely to fixed exchange regimes, dollarization implies the total elimination of the local currency, which is replaced by the U.S. dollar, and thus the exchange risk is completely eliminated (Stein et al., 1999). Note although that the exchange risk elimination is only against the U.S. dollar and not against other currencies, such as the Euro or the Yen.

Dollarization reduces also the costs associated with foreign exchange, which arises when currency transactions have to be done between different countries with different currencies. These currency conversion costs will not depend on the foreign exchange regime but on other factors, such as the commission fee that banks charge for foreign currency conversion or the in-house costs that arise when enterprises have to keep separate foreign exchange departments. Consequently, they will only disappear in the case of monetary union or dollarization where there is no need for foreign currency conversion.

Both the elimination of exchange risk costs and foreign exchange costs, reduce transaction costs associated with trade and investment flows between the U.S. and dollarized countries. Consequently, dollarization may end up boosting bilateral trade and investment flows because of lower transaction costs between them (Stein et al., 1999). The importance of the benefits of dollarization will depend on three main characteristics. Firstly, the reduction of transaction costs will be higher when the exchange rate volatility is high⁵. Secondly, the reduction of transaction costs will be higher when the foreign exchange costs associated with

⁵ Stein et al. (1999) overview several empirical studies that suggest that exchange rate volatility reduces commercial flows. However, the empirical results are not conclusive.

currency conversion are high. Finally, the increase in commercial and investment flows will be higher when the commercial and financial integration between the dollarized countries and the U.S. is high. In this sense it is important to point out that if there is a low commercial and financial integration due to trade and investment barriers, trade flows and investment flows will not increase no matter how much the transaction costs are reduced.

The benefits associated with the credible anchoring of the exchange rate to a credible currency

The local government's discretionary use of the exchange rate, which may create inflationary "surprises", is considerably reduced by the adoption of a fixed exchange regime. But adopting a fixed exchange regime is not an automatic mechanism for generating credibility; economic agents may still fear that the government will not be able to maintain the fixed exchange regime. Consequently, a fixed exchange regime with low credibility will not prevent economic actors to fear a devaluation in the future. There are two conditions that a fixed exchange regime has to fulfill in order to provide the benefits associated with the reduction in the government's ability to use the exchange rate in a discretionary way. Firstly, the commitment of fixing the exchange rate must be a credible measure. Secondly, the chosen foreign currency must be a strong currency from a country with a trustworthy reputation in relation to its monetary policy management (Stein et al., 1999). Clearly, dollarization provides the maximum benefits that can be expected in this sense as it implies a very strong commitment with a very trustworthy currency. In addition and as analyzed in Section 2, a bilateral dollarization with a very permanent character will of course have enhanced credibility effects in comparison to a unilateral dollarization.

It is argued by Stein et al. (1999) that anchoring a country's exchange rate to the U.S. dollar through dollarization will also have the following benefits:

- The inflation rate and its volatility will be reduced. Dollarization implies that the country is automatically importing the monetary policy credibility of the U.S. monetary authority and will therefore achieve a lower inflation rate. Moreover, it may even be the case that the inflation rate will converge to the level prevailing in the U.S.
- The real interest rate and its volatility will be reduced. The reduction of the ability to use the exchange rate in a discretionary way will reduce the devaluation risk and will thus reduce uncertainty in the economic environment. The reduction in the systematic

risk will induce economic agents to reduce the discount rate at which they discount future returns. The reduction in the exchange rate uncertainty will therefore reduce the real interest rates and its volatility (De Grauwe, 1994).

- The volatility of the real exchange rate will be reduced. Mussa (1986) argue that the nominal exchange rate regime has consequences on the real exchange rate and discard the veracity of the “nominal exchange rate regime neutrality”. He concludes that the short-term volatility of the real exchange rate is lower under fixed exchange regimes than under floating exchange regimes. However, he also points out that the reduction in this volatility is not necessarily a desirable feature.
- Countries with a weak currency and a low or inexistent medium to long-term local currency denominated credit market will deepen their financial system. Hausmann (1999) argues that borrowers in this kind of countries will suffer financial fragility either because of maturity mismatches or currency mismatches. The fragility appears when companies or the government want to finance their long-term investments, which often pay back in local currency, with a credit. In this case, they can either finance their long-term investments with short-term local loans and periodically get their loans renewed (maturity mismatch); or alternatively finance their projects, which often pay back in local currency, with long-term foreign loans (currency mismatch). These possibilities will certainly generate financial fragility, where a sudden decline in the liquidity of the banking system or a sudden devaluation of the currency will have serious consequences to borrowers. Clearly, the financial fragility is negatively affected by the volatility of the real interest rate in the case of maturity mismatches and by the volatility of the real exchange rate in the case of currency mismatches. The argument follows that in the case that these countries dollarized their economies, the financial fragility will be reduced as a consequence of the reduced volatility of the real interest rate and the real exchange rate. A reduced financial fragility of borrowers will in turn reduce the whole economy’s credit risk and therefore allow a deeper development of the financial system.

The most benefited countries by dollarization will therefore be those which, as a consequence of having monetary authorities with a bad reputation, have high and variable inflation rate and real interest rate, high volatility of the real exchange rate, and less developed

financial systems⁶. These benefits will also be more important for those countries which already are highly liability dollarized. A high liability dollarization means that local borrowers (companies or the government) have a large share of their debts in U.S. dollars and therefore are prone to financial fragility due to the currency mismatch. Consequently, in the case of high liability dollarization the reduction in the volatility of the real exchange rate will have even more positive effects on the financial fragility of debtors and the financial system as a whole than in the case of low liability dollarization. Finally, these benefits will be higher for those countries that have implemented a bilateral dollarization with a higher credibility and permanent character.

Costs associated with monetary independence loss

The main cost associated with the implementation of a fixed exchange regime is the loss of monetary policy independence. Theory says that an independent monetary policy provides three main benefits for an economy. Firstly, an independent monetary policy allows isolating the domestic interest rate from foreign interest rates and more freely determine the level of it. This isolation would limit, for example, the effect on the domestic interest rate of an external monetary shock that raised foreign interest rates. Secondly, it allows the monetary authorities to use monetary policy as an instrument of anti-cyclical management of the aggregate demand. This instrument can be used, for example, for smoothening the cyclical fluctuations in the economy that arise due to the business cycle or shocks to the terms of trade. The third benefit of an independent monetary policy is that it can be used to avoid severe deflationary adjustments. Even when the monetary policy does not have any effects on the aggregate demand, an independent monetary policy improve monetary authorities' ability to influence or determine the price level. In other words, central banks can always influence the inflation rate by using the money printer. The ability to influence the price level may therefore be used to avoid severe deflationary adjustments. Calvo (1999) points out that this is probably the most serious threat and danger for a country adopting a fixed exchange rate or dollarization. His argument is based on the fact that deflationary readjustments usually have very serious consequences for companies and individuals that have debts. This phenomenon is called "debt deflation" and implies that even efficient companies may suffer serious financial problems

⁶It is important to point out that Stein et al. (1999) and Hausmann et al. (1999) arguments about these benefits are based on stylized facts regarding Latin American countries and might therefore not apply to other countries or regions. These benefits will probably not be significant or may even have opposite effects for countries which are more economically developed or have more credible monetary authorities.

because their prices and incomes fall at the same time that their debts are not affected by the deflationary adjustment. Serious debt deflation problems may even end up causing massive defaults and bankruptcies, which in turn affect the whole economy⁷.

These benefits will also be lost in the case of dollarization. However, in the case of less irreversible fixed exchange regimes it is always possible for a country to modify its foreign exchange arrangement in the future. Conversely, dollarization implies that the U.S. monetary policy is not only adopted in the short run but also in the long run. Consequently, the costs associated with the loss of an independent monetary policy will be even worse in the case of dollarization as the monetary independence is lost even in the future. However, when determining these extra costs of losing the “exit option” in the future, it is central to consider how dollarization has been implemented. As seen in Section 2, a bilateral dollarization has a much more permanent character than a unilateral dollarization and is therefore more difficult to revert. Hence, losing the “exit option” in the case of bilateral dollarization will be more costly than losing it in the case of unilateral dollarization.

The Optimal Currency Area (OCA) literature identifies several criteria that will make monetary independence loss less costly for a country (Stein et al., 1999). Firstly, it will be less costly if the economic cycle of the dollarized country is highly correlated with the economic cycle of the U.S. Secondly, the costs will be less severe when the dollarized country has a higher degree of wage flexibility. Thirdly, it will be less costly if there is a high degree of labor mobility between the dollarized country and the U.S. Fourthly, the costs will be less critical when there are transfer systems between the countries, which can be used as stabilizing factors. Finally, the monetary independence loss will be less costly if the economy is highly open, where monetary policy is less effective and devaluations often cause higher inflation.

However, the traditional OCA literature does not say anything about financial issues. In order to assess the real costs of losing the monetary independence and the determination of the exchange rate level, it is important to take into account financial issues, such as the current partial dollarization and more specifically the existence of dollar-denominated debt (liability dollarization). The issue of partial dollarization will considerably change the discussion on the disadvantages of dollarization (Stein et al., 1999). Firstly, the use of monetary policy as an anti-cyclical instrument (or as a way of influencing aggregate demand) will be limited in the presence of high substitutability between the local currency and the dollar. In this case, the central bank will have a limited capacity to effectively control the financial system’s liquidity

⁷ For a more detailed description of the debt deflation problem see Stein et al. (1999).

because the money supply will also have a foreign currency component, which cannot be controlled by the central bank. Secondly, in the case of high liability dollarization, a devaluation of the currency will have catastrophic consequences to the balance of debtors. Therefore, the use of the monetary policy (through the devaluation of the domestic currency) as a mean of preventing a deflationary adjustment will have serious consequences to the domestic economy. Consequently, the cost of resigning the third benefit of an independent monetary policy will be less costly if the economy already is liability dollarized (Stein et al., 1999).

4. Issues of Implementation

In this section, some issues that arise when a country decides to implement dollarization are discussed. There are mainly two issues of implementation, namely the loss of the ability to collect seigniorage revenue and the loss of the central bank's ability to print money for lender of last resort functions. In Section 3 when discussing the theoretical costs of dollarization, the loss of the ability to collect seigniorage revenue and the loss of the ability to print money for lender of last resort functions were not identified as costs. The reason for this is that the loss of these two features will not necessarily become a cost for the dollarizing country. Whether they will be considered as a cost or not will depend on the way dollarization is fulfilled and the content of the eventual treaty between the dollarized country and the U.S. Therefore, it is better to treat the loss of these features not strictly as costs but as issues of implementation.

The seigniorage revenue

The seigniorage revenue is the revenue that a government earns because it has the monopoly of creating fiat money. Usually the country's central bank is in charge of regulating the money creation. The seigniorage revenue is a consequence of the special characteristics of the elements composing its balance sheet. Its liabilities are generally composed by the reserve requirements, which are the deposits financial intermediaries hold in the central bank, and the monetary base, or stock of fiat money. Typically, none of the above pays interest. In contrast, the asset side of the balance sheet is composed by interest-bearing assets, such as government bonds denominated both in local and foreign currency. Clearly, the central bank is making a

profit as the liabilities do not pay interest and the assets earn interest. This profit is the opportunity cost measure of the seigniorage revenue (Gros, 1993).

It is clear that when a country decides to dollarize its economy, it loses its ability to collect seigniorage revenue, which is now collected by the U.S. monetary authority. In order to assess whether this lost collection ability is a cost or not for the dollarizing country, the way the country adopts dollarization becomes of central importance. Under unilateral dollarization, the U.S. government will not share this revenue with the dollarized country. Accordingly, it should be considered as a cost for the dollarizing country. However, the situation can be different if dollarization is fulfilled by a bilateral agreement where the U.S. monetary authority agrees to share the lost seigniorage revenue with the dollarized country. The treaty between the countries will then have to address this question and proper seigniorage sharing rules will have to be settled.

However, before designing possible sharing rules, it would be important to determine the amount of the country's seigniorage revenue. This is not an easy task, as Schmitt-Grohé and Uribe (1999) show, and can lead to several misconceptions and underestimations of the seigniorage revenue. They argue that for the sake of simplicity the lost seigniorage revenue is usually estimated as the interest rate revenue on the current bond holdings by the central bank, which are backing the money circulation. This concept does not take into account the monetary base growth over time, due to inflation and output growth, and will therefore underestimate the seigniorage revenue. Schmitt-Grohé and Uribe (1999) show that this underestimation can range from -50 percent to 1000 percent depending on the value of the inflation rate and the real growth rate.⁸

Regarding the technical mechanisms for sharing the seigniorage revenue, Hausmann and Powell (1999) identify four alternative sharing rules. Nevertheless, these alternatives should not be considered as the only ones. It is probable that, as the discussion of dollarization goes on, other alternatives are proposed. The simplest rule is to estimate the seigniorage revenue as the interests earned on the central bank's reserves. These earnings will then be shared with the dollarized country by giving it an equal amount of dollars each year. This yearly disbursement may then be considered as an item in the U.S. government's yearly budget.

Another sharing rule can be to make a currency swap between the countries, where the U.S. receive a dollar-denominated non-interest-bearing bond equivalent to the dollar value of

⁸ The seigniorage revenue will only be overestimated in the unrealistic case in which the inflation rate is less than minus the real growth rate.

the domestic money in circulation and the dollarized country get an equivalent amount of dollars. The dollarized country will then retain the initial reserves and earn interests on them. This rule will be similar to the one described above but will be a one-time payment instead of several payments. This sharing rule has three main advantages in comparison to the first rule. Firstly, as there will only be one payment, it will not require a budgetary approval each year. This will probably reduce the risks of conflict between the countries that could arise if the budgetary item is not approved in a certain year. Another benefit is that it will provide the dollarizing country with the initial needed dollars necessary to swap the local currency for the U.S. dollar and will drastically reduce the liquidity barrier for dollarization. Finally, the country's initial reserves can be used to support lender of last resort functions or to create a stabilization fund to be used in crises periods.

The two alternatives above have the short come that they do not take into account the increase in seigniorage income due to money demand increases. Consequently, they may underestimate the real value of these seigniorage revenues. The two following sharing arrangements try to over come this limitation. The most accurate rule will be to monitor the flows of dollars to and from the dollarized country and periodically determine the actual stock of dollars in the country. This amount of dollars can then be used to estimate the correct seigniorage revenue loss. Although this method is the most precise and fair one, it demands a very complicated monitoring system, which can put in doubt its accuracy and cause conflicts between the countries.

The fourth sharing rule is much more practical than the above alternative, but also less accurate. Instead of regularly monitoring the stock of dollars in the economy, a fixed formula can be set to determine this value and to estimate the seigniorage revenue. The possible variables to be used in the formula could among others be the GDP growth, the population growth, the interest rate, the inflation rate, and/or other financial variables. The problem with this alternative is to construct a fair formula that accurately incorporates the fluctuations in the money demand.

The lender of last resort

One of the several functions a central bank has is serving as a lender of last resort to the banks in the financial system. There are different purposes for why banks use the lending of last resort function. Generally, banks are required to hold a legally specified fraction of their customers' deposits as vault cash or deposits with the central bank. If due to liquidity

problems a bank falls short to meet the level of reserve requirements, one of the alternatives is to borrow from the monetary authority. This lending by the central bank is equivalent to a temporary decrease in the reserve requirements and is usually a normal operation between banks. However, this liquidity problem may not be due to a temporary problem but due to a bank run. If depositors would all at once withdraw their deposits from a certain bank, the bank may end up without enough resources to meet its promises. This possibility is a consequence of the temporal mismatch between a bank's assets and liabilities. Bank runs do not necessarily affect bad managed banks, even solvent banks can be subject to essentially self-fulfilling runs. Moreover, a bank run affecting a certain bank may spread out to other banks and may end up affecting the whole financial system. Therefore, central banks are generally willing to act as a lender of last resort in order to avoid the deleterious effects of bank runs on output and employment.

Some times this lender of last resort function is exercised by central banks through the creation of new money, i.e. using their money press monopoly. Consequently, when a country dollarizes its economy, a central bank's ability to act as a lender of last resort is restricted by the loss of its ability to print money. However, although it is true that the central bank will no longer be able to print money, it will not completely lose the ability to act as a lender of last resort. There are several alternative ways a central bank can continue providing liquidity support to local banks. Consequently, the fact that dollarization implies the loss of the ability to print money should not be enough reason to consider that a country has lost the lender of last resort function. Nevertheless, it is important that the country has the political and financial ability to set up alternative ways to secure the lender of last resort function.

The first alternative to secure the lender of last resort function would be to adopt a bilateral dollarization and include in the treaty a clausal that allows local banks to have access to the Fed's discount window. This alternative has the caveat that it requires that the Fed has an extensive control and insight authority on local banks. It will thus require vast cooperation and coordination between the Fed and the country's central bank. Another alternative is to create a stabilizing fund which could be used by the central bank to perform lender of last resort functions. However, this alternative will only be at hand for those countries that have enough reserves to establish the fund. A third alternative is the one suggested by Calvo (1999). He suggests that the central bank should arrange credit lines with private international banks or even with the U.S. authorities to be used in the case of banking crises. An example for such a liquidity facility would be to arrange put options with international banks using government bonds as collateral. Through this facility, the central bank would pay a certain fee

to these international banks with the condition that if a banking crisis occurs they are obliged to purchase a certain amount of government bonds. This kind of facilities can also be arranged using the seigniorage revenue flow as collateral. This will of course depend on how the seigniorage sharing arrangement has been set up in the bilateral treaty. Finally, Fischer (1999) has suggested the need for an international lender of last resort. In this case, the country should adopt certain measures (policy conditionality and provision of collateral) in order to qualify as a potential benefactor for this liquidity help. He argues that the International Monetary Fund has increasingly been taking this role but notes that there are several measures that have to be taken to improve its ability to act as an international lender of last resort.

5. The Convertibility Plan in Argentina

After a decade of high inflation rate, including two hyperinflations, and low economic growth the Convertibility Plan was launched by end-March 1991. This plan was mainly an exchange rate based stabilization program but involved several areas of policy initiatives or regime shifts, that have had clear effects on improving supply conditions in the Argentine economy. These regime shifts have comprised at least five distinct areas, namely the Convertibility Plan, liberalization of foreign trade, deregulation, privatization, and the reform of the financial system (IMF, 1998). These reforms have changed dramatically the Argentine economic structure and have boosted economic growth and enabled price stability. As can be seen from Figure 1 the GDP was stagnated between 1980 and 1991 but from 1991 onwards it grew almost constantly; with exception of 1995 and 1999 when the GDP declined as a consequence of the “Tequila” crisis and the Brazilian crisis. The improved macroeconomic situation can also be noticed from the increase in the Gross Domestic Investment to GDP ratio. According to the Inter-American Development Bank (IADB), this ratio grew from 14% in 1990 to 19.1% in 1993 and has stabilized around that value since then. Also from Figure 2 and 3 it can be seen that the inflation rate has declined dramatically since 1991. The inflation rate has lied around zero during the last 6 years and was -0.7% in 2000.

The Convertibility Plan

This plan involved an exchange rate regime shift and, subsequently, the reform of the Central Bank’s chart. The exchange rate regime shift was achieved by the Convertibility Law of 1991

which fixed the exchange rate at one Argentine peso per U.S. dollar. It also eliminated indexing, forced the Central Bank to back two-thirds of the monetary base with international reserves, and established the full convertibility of the peso for both current and capital transactions. These rules converted the Central Bank into a form of currency board which eliminated any inflationary financing of the government's fiscal deficit⁹. The Argentine arrangement is, however, not a pure currency board since it is allowed to back up to 10% of the monetary base with government bonds.

The reform in 1992 of the Central Bank's chart made the Central Bank independent of the executive and legislative branches and set as its principal goal the maintenance of the value of the domestic currency, i.e. maintain the fixed exchange rate. The Central Bank was explicitly banned from financing public sector deficits and limitations were put on its lender of last resort functions for the rest of the financial system.

The fixed exchange rate against the U.S. dollar has been successfully maintained since the implementation of the Convertibility Plan at 1:1 and as can be seen in Figure 3 the inflation rate has been reduced from 65.2% to -0.7% between 1991 and 2000. Figure 4 shows the international reserves of the Central Bank that have increased from USD 12,767 million to USD 25,342 million between January 1993 and May 2000.

Trade liberalization

The reforms of the 1990s included also the liberalization of the trade regime to integrate the economy with external markets. The government has eliminated export taxes and most quantitative restrictions on imports. Import duties were reduced from a level in excess of 40 percent in 1989 to 9 percent by the end of 1991 (IMF, 1998). Trade reforms have been designed to reduce distortions in the productive sector, improve competition and productivity, and to help improving profitability in the tradable sector. The aim is to increase export revenues, which would increase the inflow of foreign exchange, enable payment of the external debt, and improve the sustainability of the current account deficit. The purpose behind the reduction in tariff and non-tariff restrictions on imports has been to increase the availability of capital goods and boost investment and production in the Argentine economy.

Another important improvement in the trade reform has been the creation of the Mercosur in 1995. The Mercosur is a customs union where trade of goods is free from tariff

⁹ A currency board is a monetary arrangement in which domestic currency can only be issued in exchange for a specified foreign currency at a fixed rate. This rule limits the central bank's discretionary use of monetary policy

and non-tariff barriers. Currently, there are four member states which are Argentina, Brazil, Paraguay and Uruguay, but Chile and Bolivia have agreed to join the Mercosur by 2004. In 1999, the Mercosur was the fourth biggest geo-economic area in the world with a total annual GDP of USD 1 billion and a market of 209 million inhabitants (Ministry of Foreign Affairs of Argentina).

From Figure 5 we can see that Argentina's total export revenue has increased from USD 9,656 million in 1989 to USD 23,332.7 million in 1999. This improvement in the export revenue has mainly taken place during the second half of the 1990' after the creation of the Mercosur. It is thus not surprising that the main destination of Argentine exports is Brazil with 31% of the total share (see Figure 6). The second biggest destination is the EU with 17%, the third is the USA with 8% and Chile is the fourth with 7%. In addition, Argentine imports have increased from USD 4,309.9 million to USD 25,508.2 million between 1989 and 1999 (see Figure 7). According to the Ministry of Economy of Argentina, 34% of the value of imports in 1989 corresponded to imports of capital goods, and parts and accessories for capital goods. This proportion was 43% in 1999 and would be showing that Argentina is importing a higher proportion of investment goods, which will enable a higher future growth. From Figure 8, one can see that the principal origin of Argentine imports is the EU with a share of 28% of the total. Brazil, with 22%, is the second biggest origin of imports and the U.S. is the third biggest origin with 20%.

Deregulation

The third regime shift has been the deregulation of the economy. The government has abolished all kind of price controls and closed down a number of regulatory and marketing bodies and boards. It has also reduced most industrial subsidies and encouraged the entry of new, often international, firms into the local market. The deregulation of the economy has resulted in important reductions in production, shipping, and transportation costs. It has also favored the availability and quality of gas, water, electric, and telephone services. These measures have resulted in a dramatic change in the composition and prices of goods available to the public and have favored a more dynamic economy (IMF, 1998).

to finance the financial system or governments' fiscal deficits.

Privatization

Public sector reform has involved privatizing almost all of the major public enterprises and substantially reduced the scope of the public sector. Only between 1991 and 1994 over 90 percent of all state enterprises, which were worth more than USD 20 billion, were privatized (IMF, 1998). Privatizations have had three main results. Public subsidies to these enterprises have been reduced or eliminated; enterprises' efficiency and provision of services have improved dramatically; and funds became available to cover public debt reduction. Privatized enterprises have increased efficiency and productivity mainly by reducing over staffing and by new capital investments. Employment in the privatized enterprises was reduced between 1989 and 1994 from 302,000 to 138,000 (IMF, 1998).

Financial system reform

The deepening of the Argentine financial system has been one of the key factors in the restructuring of the economy. The reform of the financial system has been a continuous process since the implementation of the Convertibility Plan which has been possible due to the achieved price stability and the implementation of new banking regulations. These new banking regulations have increased banking and financial intermediation efficiency and have increased competition between them. The regulations have also ensured the safety of individual banks and of the banking system as a whole, have removed restrictions on the entry of foreign banks, and have encouraged the opening of new branches of domestic banks (IMF, 1998).

According to the Central Bank of Argentina (BCRA), the run on deposits during the "Tequila" crisis (Mexico) in early 1995 generated a system wide decline in deposits of 18 percent over five months, which had severe repercussions to the liquidity of the banking system. This crisis led authorities to implement further reforms which strengthened notably the financial system. These reforms have included the creation of two trust funds to help privatizing provincial banks and restructuring or merging private banks. Traditional reserve requirements have also been replaced by remunerated liquidity requirements that are mostly held offshore (IMF, 1998). Another, very quoted, improvement has been the creation of a USD 6.1 billion contingent repurchase facility with international banks to provide liquidity to the banking system in the case of a liquidity crisis.

In 1990, financial intermediation had reached the lowest point in more than a decade with a ratio of broad money (M3) to GDP of 6% (IMF, 1998). But by 1999 the ratio of broad money had dramatically improved to 32.2% (BCRA). As can be seen in Figure 9 the increase in the confidence of the banking system enabled an increase in the total deposits of the Argentine economy from USD 7,244 million in January 1991 to USD 82,374 million in July 2000. Also domestic credit to the private sector as a percentage of GDP grew from 9% in 1990 to 24.4% in 1999 (IADB). It is important to remark that despite the great improvement and strengthening of Argentina's financial system in this period, indicators of financial deepening such as broad money (M3) and credit to the private sector to GDP, remain well below industrial country levels¹⁰ (IMF, 1998).

Partial Dollarization in Argentina

Despite of the improved macroeconomic situation it must be noticed that the transformation of Argentina has been very much based on the increase of the external debt and the increase in the partial dollarization of the economy. Although it is difficult to find all the economic parameters that would prove that the partial dollarization of Argentina has increased during the convertibility plan, some parameters such as the currency composition of domestic deposits, the total external debt, which includes private and public external debt, the currency composition of total public bonds, and the currency composition of total loans from financial entities to the public sector (excluding public bonds) and to the private non-financial sector, can give an approximation to the degree of partial dollarization. From Figure 9 and Table 1, one can observe that the currency composition of total deposits in Argentina has constantly shifted towards U.S. dollar deposits since the implementation of the Convertibility Plan, i.e. the partial dollarization has increased. In January 1991 deposits in pesos and in U.S. dollars represented 58.5 % and 41.5 % respectively of total deposits. This proportion has deviated steadily towards U.S. dollar deposits and was in July 2000 41.3 % and 58.7 % respectively. From the liability side it can be acknowledged that the external debt increased from USD 58,588 million in December 1991 to USD 147,667 million in September 2000 (Ministry of Economy of Argentina). Moreover, according to the Ministry of Economy the total nominal actualized value of Public Bonds in circulation on 30 July 2000 was USD 88,089.5 million of which 65% was U.S. dollar denominated, 25% was Euro denominated, 5% was Peso

¹⁰ The ratio of M3 to GDP stood in 1996 around 67% in Germany, 59% in the USA, 79% in Spain, which is much higher than Argentina's 32,2%.

denominated and 5% was denominated in other currencies (see Figure 10). Also from Figure 11 and Table 2 it can be seen that between January 1994 and July 2000 the loans from financial entities to the public sector (excluding public bonds) and to the private non-financial sector that were U.S. dollar denominated increased proportionally more than the peso denominated loans, i.e. the liability dollarization increased. One can see that the proportion of loans in pesos and U.S. dollar shifted from 43.2% and 56.8% respectively in January 1994 to 33.1% and 66.9% respectively in July 2000. These last indicators from the liability side do not only show that the partial dollarization has increased but more importantly that the liability dollarization has increased since the implementation of the Convertibility Plan and that Argentina is currently a highly liability dollarized country.

Calvo (1999) and Hausmann (1999) point out two different explanations for the high degree of liability dollarization in Latin American countries that also apply to Argentina. Calvo (1999b) points out as the main reason for liability dollarization the fact that most Latin American countries have depended on foreign savings (i.e. current account deficits) during the last decades for growth. Moreover, the current account deficits have mainly been financed by external loans, which are denominated in U.S. dollars. There are two reasons for why the foreign loans are U.S. dollar denominated:

- 1) Institutional factors. Bank regulations often inhibit banks to have large mismatches between the currency denomination of their assets and liabilities. Foreign banks whose liabilities are to a large extent expressed in U.S. dollars will find it unattractive to have peso denominated assets, i.e. peso denominated loans. The disincentive is a consequence of the uncertainty about the future exchange rate differential.

- 2) Informational factors. Predicting the exchange rate is a difficult task due to structural and policy-incentive concerns. For less developed countries this difficulty is aggravated both because they have more volatile monetary aggregates than industrialized countries and because their governments are more prone to be influenced by interest groups, which may lobby for a devaluation of the currency. Furthermore, foreign investors will normally be fearful of local currency denominated government debt because they know that the government may have policy incentives to devalue its own currency in order to reduce the foreign currency value of the local currency denominated government debt.

Hausmann (1999) on the other side argues that liability dollarization is a consequence of the combination of a weak currency with the need to finance long-term investments to spur growth. He calls this theory “original sin”. The assumption behind this theory is that the currency cannot be used for foreign nor long term-term borrowing. Thus, when companies want to finance their projects they face two possibilities. They can finance their long-term investments with short-term loans and periodically try to get their loans renewed. Alternatively, they can finance their projects, which often pay back in local currency, with long-term foreign loans. Clearly, a country where many of its companies choose this last alternative will be highly liability dollarized.

6. Dollarization in Argentina

Even if Argentina has managed to undergo many important structural reforms and achieved a relatively stable macroeconomic situation, there are still many factors that from time to time downturn the economic situation. Argentina has been affected very severely by different financial turmoil during the second half of the 1990’s, such as during the “Tequila” (Mexico) crisis (end-1994 – early-1995), the failed attack on the Hong Kong dollar (October 1997), the Russian default (August 1998) and the Brazilian crisis (January 1999). Although these crises have never been originated in Argentina, they have had serious contagion effects on its financial system. As can be seen from Figure 12, which shows the interest rate on loans granted to prime companies in Argentina, the interest rate on loans has been very unstable during the second half of the 1990’s. The Tequila crisis and the Brazilian crisis are those two crises that have had most impact on Argentina’s financial system and in turn to the whole economy. In this sense, it is important to point out that in 1995 the real GDP fell by 2.8%. Furthermore, Argentina has been in recession since the Brazilian crisis with a growth rate of –3.4% and –0.5% in 1999 and 2000 respectively (Ministry of Economy, Argentina).

One explanation to the volatility of the interest rate is that during crisis periods there have always been speculations that the government will fail to defend the convertibility and will devaluate the peso. This has lead to an increase in the devaluation risk and therefore to a broadening of the spreads between interest rates in pesos and dollars (it is not difficult to see from Figure 12 that this differential has been larger than normal during crisis periods). It is in this context that the debate on the best exchange rate arrangement for Argentina has focused on whether it should continue with the Convertibility Plan, create a common currency with

the Mercosur, or adopt the U.S. dollar (Dollarization). This debate was intensified in January 1999 when Argentina's president at the time Carlos S. Menem proposed dollarizing the economy as a response to the devaluation rumors that aroused after Brazil's devaluation of the Real.

In this section each of the theoretical benefits and costs for dollarization, which were presented in Section 3, will be discussed for Argentina. When analyzing each of the benefits and costs one should always have in mind the special characteristics of Argentina, i.e. the existence of the Convertibility regime and the current high partial dollarization of the economy. The already existence of the Convertibility regime and the fact that it is a very strong fixed exchange regime will have as a result that most of the benefits and costs of dollarization have already been born by Argentina. The fact that it is highly partial dollarized will have consequences to the discussion of the benefits associated with the credible anchoring of the exchange rate to a credible currency and the costs associated with monetary independence loss.

The benefits associated with the reduction of transaction costs

As seen in the theoretical analysis of dollarization in Section 3, one of the benefits of dollarization is that it reduces transaction costs which may end up boosting bilateral trade and investment flows between the U.S. and dollarized countries. It has also been stated that the benefits of dollarization will be higher when the foreign exchange costs and the exchange risk costs are high. These benefits will also be higher if there is a high commercial and financial integration. However, these benefits will not materialize if the commercial and financial integration is low due to trade and investment barriers. Therefore, the degree of commercial and financial integration between Argentina and the U.S. will firstly be determined to assess the importance of the benefits associated with the reduction of transaction costs. The second step will be to analyze for Argentina each of the factors that bring about the reduction in the transaction costs, i.e. the foreign exchange costs and the exchange risk costs.

In the case of commercial integration and as the benefit for Argentina is being analyzed, one should look at its exports to the U.S. to determine the degree of commercial integration. As seen in Figure 6 only 8% of Argentina's exports were to the U.S. in 1998. Furthermore, although the tariff restriction on Argentine exports have decreased in the last years to reach an average of 5.25% in 1998, the non-tariff restrictions have increased and become less direct and clear (National Foreign Trade Commission, 1999). Almost 55% of

Argentina's exports to the U.S. face some kind of non-tariff restriction and the most affected sector by these barriers is the manufactures with agriculture origin, which is Argentina's most important export sector. The National Foreign Trade Commission of Argentina concludes in its study that these non-tariff restrictions are the main reasons for the low export revenue to the U.S. One can therefore conclude that Argentina is not a very commercially integrated country with the U.S. Moreover, although it has been agreed to establish a common American market, the FTAA, and that the negotiations for it should be ready before 2005, it is not probable that this trade integration will become true in the immediate future. Consequently, one should not expect Argentine export revenues to the U.S. to increase significantly by the reduction of transaction costs.

On the other hand, financial markets in Argentina are quite integrated to the U.S. Currently there are no legal restrictions in Argentina to perform commercial and financial operations with the exterior. Furthermore, the entrance and exit of foreign currency is completely free and guaranteed by law (BCRA, 2001). Although it is difficult to find data on the origin of financial inflows to Argentina, it may be representative to look at the origin of Foreign Direct Investments (FDI) to get an idea of the financial integration with the U.S. In the period between 1992 and 1995, FDI from the U.S. totaled USD 5,295 million, which represented 38.2% of the total inflow of FDI. Moreover, 36% of the total stock of FDI in 1995 had its origin in the U.S. (United Nations, 1998). It can therefore be concluded that the financial integration between Argentina and the U.S. is important. Accordingly, U.S. investment flows will gain the maximum benefits from the reduction in transaction costs.

Regarding the foreign exchange cost, it can be concluded that dollarization will bring about a minimal or irrelevant reduction in foreign exchange costs for companies investing in Argentina and/or Argentine firms trading with the U.S. One of the reasons for this is that the Convertibility Law guarantees that one U.S. dollar is converter for one Peso or vice versa. Accordingly, the market bid-ask spread between the U.S. dollar and the Peso is very low and no commissions for converting U.S. dollars into pesos or vice versa are charged by banks. The market bid-ask spread between the U.S. dollar and the Peso was, for example, as low as 0.02% on the 19 March 2001 (Patagon.com). This value can be compared to the bid-ask spread between EU currencies which is about 0.5% at the wholesale level at which the corporate sector operates and between 2% and 5% for retail transactions (Gros and Thygesen, 1998). Furthermore, the in-house costs that arise because enterprises have to maintain separate foreign currency expertise can neither be very important. The reason is that the relation between the U.S. dollar and the Peso is 1:1 and therefore it is not difficult to make

calculations between the currencies. In addition, given the high inflation history of Argentina, most Argentine companies are very used to work with both U.S. dollars and pesos.

Regarding the exchange risk cost, the exchange rate between the Peso and the U.S. dollar has been successfully fixed for almost 10 years at a parity of 1:1, i.e. the exchange rate volatility has been null. Furthermore, the facts that having dollar denominated bank accounts and debts is completely legal and that the U.S. dollar is commonly used as a means of payment allows many companies to have large part of their assets and liabilities in U.S. dollars, i.e. some kind of costless “hedging”. Consequently, the exchange risk costs for companies investing in Argentina and/or Argentine firms trading with the U.S. should be null or close to zero. However, as seen in the introduction of this section economic actors still fear from time to time that a devaluation will take place and therefore the exchange risk has not been totally eliminated by the Convertibility regime. It can therefore be expected that abandoning the Convertibility regime and adopting the U.S. dollar will further reduce exchange risk costs.

Based on the above analysis, it can be concluded that the benefits associated with the reduction of transaction costs will be very limited for Argentina in the case of dollarization. Almost all the reduction in foreign exchange costs and most of the reduction in exchange risk costs have already been achieved with the Convertibility regime. In the case of dollarization, most of the benefit will come about through an increase in investment flows from the U.S. to Argentina due to reduced exchange risk costs. On the other hand, Argentine export revenues will probably not be very affected by dollarization.

The benefits associated with the credible anchoring of the exchange rate to a credible currency

It was noticed in Section 3 that the second group of benefits of dollarization is related to the reduction of the government’s ability to use the exchange rate in a discretionary way. It was also pointed out that these benefits will also be more important for countries which are highly liability dollarized and have implemented dollarization through a bilateral agreement.

Therefore, when analyzing the case for Argentina, one should have in mind that the Convertibility regime is a very trustworthy fixed exchange regime that has been in place since 1991 and that has successfully managed to survive several serious currency crises. It should also be remembered that Argentina is a highly liability dollarized country.

One of the benefits that the Convertibility regime has already achieved is the reduction in the inflation rate and its volatility. As seen in Figure 3 the inflation rate has been declining since 1991 and has been maintained below 2% since 1995. Moreover, since 1995 the inflation rate of Argentina has been lower than the inflation rate of the U.S. (Bureau of Labor Statistics, U.S.). Therefore, dollarization will not have any benefit in this sense for Argentina.

According to the economists that are in favor of dollarization the principal benefit for Argentina will be the one related to the reduction of the real interest rate and its volatility. Despite of having a fixed exchange rate for almost ten years, the real interest rate and its volatility are still high in Argentina (see Figure 12). They argue that devaluation rumors are from time to time increasing the volatility of the real interest rate and that the interest rate is kept high for that reason. Their argument follows that if the economy is dollarized the devaluation risk will disappear, the real interest rate volatility will be reduced, and the interest rate level will fall. Moreover, they claim that the country risk will also be reduced by the reduction of the devaluation risk¹¹. In turn, the reduction in the country risk will further lower the real interest rate level. Clearly, the real interest rate fall will be more important for Argentina if dollarization is implemented through a bilateral agreement with a very permanent character.

However, there are other economists that argue that the high level of the real interest rate and its volatility are not a consequence of devaluation rumors but essentially a consequence of the high country risk. They point out that even dollar denominated loans have had high and volatile real interest rates and therefore the high volatility cannot be a consequence of devaluation rumors. They argue that in order to reduce the country risk and the real interest rate level measures such as reducing the public deficit or reducing the current account deficit will be needed. If this view is correct, dollarization will not be very effective for Argentina in reducing the interest rate and its volatility.

Whether devaluation rumors or the country risk is the dominating factor behind the high real interest rate level and its volatility is something that has to be investigated more thoroughly. There are two recent studies in this direction, Berg A. and Borensztein, E. (2000) and Escudé, G. et al. (2000), which estimate the reduction in the interest rates for Argentine dollar denominated government bonds that could come about by eliminating the currency risk. Both studies conclude that the spread between U.S. treasuries and Argentine dollar denominated treasuries will be reduced in the case of dollarization. However, while Berg A.

¹¹ For a discussion of the reasons for why the disappearance of the devaluation risk would reduce the country risk see Berg, A. and Borensztein, E. (2000).

and Borensztein E. (2000) estimate that the reduction will be between 72 and 271 basis points, Escudé, G. et al. (2000) estimate that this reduction will be between 21% and 25% lower if one includes the effects of risk aversion as opposed to assuming risk neutrality.

The third theoretical benefit of dollarization was the reduction in the volatility of the real exchange rate. From Figure 13 one can see that Argentina's real exchange rate against the U.S. dollar has been quite stable since 1993, i.e. there has been very little volatility. Therefore, going from the Convertibility regime to dollarization will probably not lower the real exchange rate volatility any further. It is most likely that the benefit of reducing the volatility of the real exchange rate has already been achieved by the Convertibility regime.

The last benefit of anchoring the exchange rate to the U.S. dollar through dollarization was the reduction of the financial fragility in countries with a weak currency and a low or inexistent medium to long-term local currency denominated credit market. This financial fragility is caused by currency mismatches and maturity mismatches in connection with a volatile real exchange rate and a volatile real interest rate respectively. In the case of Argentina, it can be asserted that although the Convertibility regime has been in place for almost 10 years there is a very limited medium to long-term local currency denominated credit market. For example, the Argentine government did not issue any peso denominated medium to long-term bond during 2000 and 2001 (Ministry of Economy, Argentina). Furthermore, only 5% of the Public bonds are peso denominated (see Figure 10). In addition, only 22.4% of the total stock of mortgage loans, which often are medium to long-term loans, to the private non-financial sector were peso denominated in September 2000 (BCRA). For this reason private firms and the government usually suffer from both maturity mismatches and currency mismatches when they take loans in Argentina. In the case of currency mismatches and as seen in Figure 13, the volatility of the real exchange rate against the U.S. dollar has not been very high since 1993. Therefore, it is probable that most of the reduced financial fragility caused by currency mismatches is already being achieved by the Convertibility regime. However, as Argentina is highly liability dollarized, the fears of devaluation in the future causes fears of financial fragility. Therefore, as dollarization will put an end to devaluation rumors, it will assure that the currency mismatch will not produce financial fragility in the future. On the other hand and as seen in Figure 12, the volatility of the real interest rate has been very high in Argentina. This is showing that the maturity mismatch is a mayor cause of financial fragility for Argentine companies and the government. Therefore, if dollarization brings about a reduction in the real interest rate one should expect a reduction in the financial fragility due to maturity mismatches and a reduction in the stock of

problem loans. Both the elimination of the risk that currency mismatches causes financial fragility in the future and the reduction in the financial fragility caused by maturity mismatches will reduce Argentina's credit risk and therefore allow a deeper development of the financial system.

Concluding, the benefits associated with the credible anchoring of the exchange rate to a credible currency will have positive consequences for Argentina in the case of dollarization. Although the Convertibility regime has already achieved some of these benefits, dollarization will imply a further step ahead in the credibility issue and will therefore generate some additional benefits. In this sense, the reduction of the real interest rate and its volatility will probably be the most important benefit for Argentina. The reduction in the financial fragility of debtors caused by maturity mismatches will also be an important benefit if dollarization brings about a stabilization of the real interest rate. Another benefit will be the elimination of the risk that currency mismatches cause financial fragility in the future. The elimination of this risk is very important for Argentina because it is a highly liability dollarized country, where a sudden devaluation will cause widespread defaults and bankruptcies. All these benefits will probably cause a further deepening of Argentina's financial system. In addition, these benefits will be higher if dollarization is fulfilled by a bilateral agreement with a more permanent character. On the other hand, dollarization will probably not have any effects on the inflation rate and its volatility, and the real exchange rate.

Costs associated with monetary independence loss

It is clear that dollarization is not a costless measure and will imply the total loss of the monetary policy independence in the short run as well as in the long run. As seen in the theoretical analysis, Dollarization will make the isolation of the internal interest rate to the external ones more difficult. It will also limit the central bank's ability to manage the aggregate demand and impede the monetary authorities to influence the price level. However, the loss of the monetary independence is less costly if the dollarizing country is a highly partially dollarized economy and forms an OCA with the U.S.

As remarked in several occasions, Argentina has already a currency board in place since 1991. Accordingly, the costs of losing the monetary independence are already being born by the current fixed exchange regime. Therefore, dollarization will not generate additional costs in the short run despite the fact that Argentina and the U.S. do not form an OCA. However, dollarization will also imply, as opposed to the Convertibility regime, that

this independence is lost even in the future. Therefore, the cost of dollarization for Argentina will be the cost of losing a future “exit option”. Determining the value of this “exit option” is most probable an impossible task. However, it may be interesting to analyze the factors that influence the cost of losing the “exit option”. Firstly, although dollarization is an almost permanent measure, there might still be a possibility in the future, if not minimum, to revert the measure. Hence, it will be crucial to analyze how dollarization is fulfilled in Argentina in order to determine the value of the lost “exit option”. Obviously, a bilateral dollarization with a very strong agreement between Argentina and the U.S. will lead to a situation where the “exit option” is lost for all the future. Conversely, a unilateral dollarization will imply that the “exit option” is more accessible. Accordingly, the lost “exit option” will be more costly if Argentina fulfills a dollarization with a very permanent character. The second factor to consider is the value of the monetary independence in Argentina. In this sense it is interesting to point out that the reason for establishing the Convertibility regime was exactly to relinquish this monetary independence and adopt that of the U.S. to gain price stability and credibility. Furthermore, Hausmann et al. (1999) argue that devaluations in Latin America have not only been accompanied by high inflation rates and high interest rates but have also been contractionary. According to these stylized facts, the monetary independence is currently not very worth for Argentina. Furthermore, the current high partial dollarization of Argentina is another factor that makes the value of the monetary independence less worth. As seen in Section 3, a high partial dollarization implies that the use of monetary policy as an anti-cyclical instrument will have limited effects on the aggregate demand. In addition, the high liability dollarization of Argentina will make devaluations very costly in terms of massive bankruptcies, which will generate large social costs. As described in Section 3, a sudden devaluation will make some of the loan takers to experience a sharp fall in the value of their revenues in dollar terms, and will therefore restrain their ability to service their dollar debts. Obviously, the high partial dollarization both on the asset side and the liability side makes the loss of the “exit option” less costly for Argentina.

Given all the elements analyzed above, the loss of the “exit option” should not be very costly for Argentina. However, the current situation might change in the future and therefore one should also look at the future economic stance for Argentina. In order to assess the real cost of losing the “exit option”, questions such as what kind of country will Argentina be in the future, will Argentina converge to an OCA with the U.S., which will be its main trade partners and which exchange rate arrangement will they have, will the high partial dollarization continue or will the government actively try to reduce it, etc should be answered.

These questions are very difficult to answer, especially for a country like Argentina where the politicians are unwilling to have a profound and serious debate about the Argentine future. However, roughly speaking the cost of losing the “exit option” will be lower if Argentina continues being a highly partially dollarized country both on the asset and liability side. In addition, the cost will be lower if Argentina converges to an OCA with the U.S. This convergence will improve if Argentina integrates it self more with the U.S. and the FTAA. On the other hand, the cost of losing the “exit option” will be higher if it decides to integrate more with the Mercosur at the same time that Brazil continues to be reluctant to the FTAA agreement and to a fixed exchange rate against the U.S. dollar. In this sense, it is important to point out that the current recession in Argentina started in early 1999 when Brazil devaluated the Real against the U.S. dollar, which reduced remarkably Argentina’s competitiveness (see Figure 13).

7. The Seigniorage Revenue in Argentina

In this section, estimates on Argentina’s seigniorage revenue for the period between 1993 and 2000 are presented. The present discounted value of the seigniorage income, which would be transferred to the U.S. government if Argentina dollarized its economy, is also estimated. In order to estimate the seigniorage revenue, the opportunity cost measure of seigniorage has been used (Gros, 1993). According to this definition, the seigniorage revenue is given by equation (7.1)

$$S_t = iC_t + (i - i_r)RR_t \quad (7.1)$$

where S_t is the seigniorage revenue in period t , C_t is the currency in circulation, RR_t is the total required reserves held by commercial banks with the central bank, i is the interest rate on government debt (i.e. bonds), and i_r is the interest rate paid on the required reserves.

However, for simplicity, it has been assumed that $i = i_r$, and therefore the imposition of required reserves does not increase seigniorage.¹² The seigniorage revenue for Argentina was then estimated using equation (7.2)

¹² This is a realistic assumption for Argentina because the BCRA pays an interest to all the reserve requirements (BCRA, 2001).

$$S_t = iC_t . \quad (7.2)$$

Table 3 presents the average value of the monetary base and the total seigniorage revenue for Argentina between 1993 and 2000. The table shows both the monetary base and the seigniorage revenue in absolute value and as a percentage of nominal GDP. The seigniorage revenue is also presented as a percentage of the total fiscal revenue. The yearly seigniorage revenue was calculated by summing up monthly seigniorage revenues. In turn, the monthly seigniorage revenue was estimated by multiplying the monthly stock of monetary base by the monthly interest rate on U.S. treasuries with a 10-year maturity. The reason for choosing the interest rate on U.S. treasuries is that the Convertibility law forbids the Central Bank to back up more than 10% of the monetary base with national bonds, and therefore U.S. treasuries are used to back up most of the monetary base. From the table it can be seen that both the monetary base and the seigniorage revenue have been quite stable during the period. The monetary base has for example only grown from USD 13,006 million in 1993 to USD 13,866 million in 2000. Similarly, the seigniorage revenue has grown from USD 761 million to USD 836 million in the same period. One of the main reasons for these low growth rates has been the low inflation rate for Argentina during the period. In addition, the three presented ratios have also been fluctuating around some constant values, the monetary base / nominal GDP ratio has fluctuated around 5%, the seigniorage revenue / nominal GDP ratio has fluctuated around 0.3%, and the seigniorage revenue / fiscal revenue has fluctuated around 1.5%. These ratios show that the Argentine government has not been using the inflation tax as a major source of fiscal income during the period. Moreover, these ratios are in strict contrast to the behavior of the past decade when the seigniorage / GDP ratio fluctuated around values such as 3.7% and 7.8% (Kiguel and Neumeyer, 1995).

In Table 4 the present discounted value of the seigniorage revenue (PDVS) is presented, both in absolute value and as a percentage of nominal GDP¹³. The PDVS has been estimated for three different inflation rate scenarios, a) a low inflation environment, b) a medium inflation environment, and c) a high inflation environment. The formula that has been used for estimating the present discounted value of the seigniorage revenue is derived in the Appendix. For estimating the seigniorage income by this formula four variables are needed: a) the monetary base, b) the inflation rate, c) the nominal interest rate, and d) the real growth

¹³ The nominal GDP used was USD 285 044 million, which was Argentina's GDP in 2000.

rate. In the case of the monetary base (or currency in circulation), it has been assumed that its initial value is equal to USD 13,500 million, which was the approximate value for February 2001. Note also that the used formula assumes that the currency in circulation / nominal GDP ratio is constant over time, and therefore the currency in circulation will be growing at the rate $(1 + g_t)(1 + p_t)$. For the inflation rate, the interest rate and the real growth rate, it has been assumed that their values are constant over time. However, for the inflation rate, four different values for each of the three different inflation scenarios have been chosen. It has been assumed that an inflation rate between 0% and 3% represents a low inflation environment, an inflation rate between 3% and 6% represents a medium inflation rate, and an inflation rate between 6% and 9% represents a high inflation environment. In the case of the interest rate, it has been assumed that it undertakes a different value for each of the three inflation scenarios, namely 6%, 9%, and 12% for the low inflation environment, the medium inflation environment and the high inflation environment respectively. The reason for choosing these ad-hoc values has been, given the inflation rate, to obtain a real interest rate of between 3% and 6%. In the case of the real growth rate, it has been assumed to adopt values between 1% and 4% in all the three environments. It is important to point out that it was not possible to estimate the PDVS for the cases where $\left| \frac{1+u}{1+i} \right| > 1$ and therefore there are some fields that instead of a value has a “-“.

In the scenario with a low inflation rate and a 6% interest rate, the estimated PDVS assumes values between USD 17,172 million and USD 91,340 million. These values are equal to 6% and 32% of Argentina’s nominal GDP in 2000. Differently, in the medium inflation environment with a 9% interest rate, the PDVS fluctuates between USD 26,647 million (or 9.3% of GDP) and USD 157,661 (or 55.3% of nominal GDP). In the case of the high inflation scenario with a 12% interest rate, the PDVS is much higher with an under limit of USD 36,729 million (12.9% of GDP) and an upper limit of USD 252,000 million (88.4% of GDP). Although, it is probable that the real value of the PDVS is in between these values, it might be interesting to obtain some specific possible values for the PDVS. Therefore, three further scenarios have been assumed. In the first scenario, it is assumed that the values for the inflation rate, the interest rate, and the real growth rate are equal to their average values between 1993 and 2000. The average inflation rate for Argentina between 1993 and 2000 has been 1.4%, the average interest rate for U.S. treasuries with a 10-year maturity has been 6.2%, and the average real growth rate has been 2.1%. The PDVS in this scenario is USD 33,284

million (11.7% of GDP). For the second scenario, it is assumed that Argentina's inflation rate and real growth rate converges to the U.S. average values for the period between 1980 and 2000. In this period the average inflation rate was 4% and the real growth rate was 3.12% in the U.S. The average value for the interest rate was 8.5%. In this case, the PDVS is USD 99,190 million (34.8% of GDP). The third scenario is equal to the second but it was assumed that the values converge to the average ones for the period 1990 to 2000. In this period the average inflation rate, interest rate and real growth rate was 3%, 6.6% and 3.2% respectively. Thus, the PDVS is USD 312,436 million (109.6% of GDP).

8. Conclusion

Official dollarization has several potential economic benefits but also some economic costs. In the case of Argentina, it can be concluded that many of these benefits and costs are already being born by the Convertibility regime. However, as the Convertibility regime has not been completely successful in providing full credibility about the fixed exchange rate, Argentina may still have some scope for benefiting from official dollarization. Essentially, official dollarization will bring about an increase of investment flows from the U.S. due to the reduced exchange risk costs, a reduction of the real interest rate and its volatility due to a reduced devaluation risk, an elimination of the risk that currency mismatches causes financial fragility in the future, and a reduction in the financial fragility of debtors caused by maturity mismatches. On the other hand, Argentina will lose the "exit option" in the case of official dollarization and therefore will lose the ability to have an independent monetary policy in the future.

Regarding the present discounted value of the seigniorage revenue for Argentina, it is confirmed that it is not a negligible amount. Although the estimates of the present discounted value of the seigniorage revenue considerably varies depending on the different assumptions made, three probable scenarios present values such as USD 33,284 million (or 11.7% of nominal GDP), USD 99,190 million (34.8% of GDP), and USD 312,436 million (109.6% of GDP). Therefore, if Argentina seriously considers to dollarize its economy, it should try to reach an agreement with the U.S. authorities where the seigniorage revenue is shared.

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TABLE 1
Total Peso and USD Deposits in Argentina

End of period	Deposits				Total deposits (million)
	in pesos		in USD		
	(million)	as % of total	(million)	as % of total	
1991 January	4 238,64	58,5%	3 005,19	41,5%	7 243,83
July	6 110,91	55,8%	4 838,76	44,2%	10 949,67
1992 January	8 460,38	54,8%	6 970,07	45,2%	15 430,45
July	12 087,52	57,8%	8 816,56	42,2%	20 904,07
1993 January	14 824,46	57,1%	11 128,66	42,9%	25 953,13
July	16 936,15	53,0%	15 041,66	47,0%	31 977,82
1994 January	22 902,65	54,4%	19 209,58	45,6%	42 112,23
July	23 113,50	51,7%	21 576,88	48,3%	44 690,38
1995 January	20 377,05	46,1%	23 835,35	53,9%	44 212,40
July	19 414,34	47,9%	21 103,06	52,1%	40 517,39
1996 January	21 672,91	47,0%	24 400,60	53,0%	46 073,50
July	24 593,23	48,1%	26 549,90	51,9%	51 143,12
1997 January	27 117,37	48,5%	28 792,47	51,5%	55 909,84
July	31 188,37	48,3%	33 345,84	51,7%	64 534,21
1998 January	32 987,82	46,6%	37 768,72	53,4%	70 756,54
July	36 430,01	48,0%	39 505,62	52,0%	75 935,63
1999 January	33 519,67	43,3%	43 954,16	56,7%	77 473,83
July	34 620,00	42,9%	45 997,95	57,1%	80 617,95
2000 January	33 488,16	41,5%	47 200,45	58,5%	80 688,62
July	33 996,59	41,3%	48 377,66	58,7%	82 374,25

Source: BCRA, Argentina

TABLE 2Total Peso and USD Loans from Financial Entities in Argentina ⁽¹⁾

End of period	Loans				Total loans (million)
	in pesos		in USD		
	(million)	as % of total	(million)	as % of total	
1994 January	18 991,77	43,2%	24 992,63	56,8%	43 984,40
July	20 320,05	42,0%	28 085,72	58,0%	48 405,77
1995 January	20 994,97	40,1%	31 339,90	59,9%	52 334,87
July	20 103,21	39,4%	30 885,21	60,6%	50 988,42
1996 January	20 026,09	38,2%	32 411,43	61,8%	52 437,52
July	20 771,62	38,7%	32 961,10	61,3%	53 732,72
1997 January	21 438,21	36,9%	36 581,34	63,1%	58 019,55
July	22 830,75	36,4%	39 963,32	63,6%	62 794,07
1998 January	24 353,89	35,6%	44 139,10	64,4%	68 492,99
July	26 506,93	36,5%	46 056,51	63,5%	72 563,44
1999 January	25 641,57	33,8%	50 252,35	66,2%	75 893,92
July	25 961,22	34,4%	49 540,55	65,6%	75 501,77
2000 January	26 062,34	33,6%	51 596,64	66,4%	77 658,98
July	25 097,96	33,1%	50 707,78	66,9%	75 805,74

(1) Loans to the public sector (excluding public bonds) and to the private non-financial sector.

Source: BCRA, Argentina

TABLE 3

Argentina's Monetary Base and Seigniorage Revenue

Year	Monetary Base ⁽¹⁾ in USD (million)	Seigniorage Revenue ⁽²⁾ in USD (million)	Monetary Base / Nominal GDP	Seigniorage Revenue / Nominal GDP	Seigniorage Revenue / Fiscal Revenue
1993	13 006,2	761,1	5,50%	0,32%	1,52%
1994	15 353,6	1 086,0	5,96%	0,42%	2,16%
1995	11 376,4	747,6	4,41%	0,29%	1,52%
1996	12 424,0	800,4	4,57%	0,29%	1,71%
1997	13 982,8	886,3	4,77%	0,30%	1,62%
1998	14 880,5	783,1	4,98%	0,26%	1,39%
1999	14 490,1	816,8	5,12%	0,29%	1,47%
2000	13 866,3	835,9	4,86%	0,29%	1,49%

(1) Average yearly value.

(2) The yearly seigniorage revenue was calculated by summing up monthly seigniorage revenues. The monthly seigniorage revenue was estimated by multiplying the monthly stock of monetary base by the monthly interest rate on U.S. treasuries with a 10-year maturity.

Source: Ministry of Economy, Argentina, Bureau of Labor Statistics, U.S., and own calculations

TABLE 4

The Present Discounted Value of Seigniorage Revenue for Argentina ^{(1) (2)}
 in USD millions and as % of nominal GDP

(a) Low inflation environment and 6% nominal interest rate

		Inflation rate							
		0%		1%		2%		3%	
Real Growth rate	1%	17 172	6,0%	21 519	7,5%	28 812	10,1%	43 583	15,3%
	2%	21 465	7,5%	28 812	10,1%	43 806	15,4%	91 340	32,0%
	3%	28 620	10,0%	43 584	15,3%	91 340	32,0%	-	-
	4%	42 930	15,1%	89 438	31,4%	-	-	-	-

(b) Medium inflation environment and 9% nominal interest rate

		Inflation rate							
		3%		4%		5%		6%	
Real Growth rate	1%	26 647	9,3%	33 443	11,7%	44 893	15,7%	68 266	23,9%
	2%	33 613	11,8%	45 355	15,9%	69 703	24,5%	150 494	52,8%
	3%	45 510	16,0%	70 444	24,7%	155 806	54,7%	-	-
	4%	70 444	24,7%	157 661	55,3%	-	-	-	-

TABLE 4 (Continued)

(c) High inflation environment and 12% nominal interest rate

		Inflation rate							
		6%		7%		8%		9%	
Real Growth rate	1%	36 729	12,9%	46 168	16,2%	62 137	21,8%	94 995	33,3%
	2%	46 763	16,4%	63 441	22,3%	98 609	34,6%	221 268	77,6%
	3%	64 340	22,6%	101 363	35,6%	238 737	83,8%	-	-
	4%	103 091	36,2%	252 000	88,4%	-	-	-	-

(1) See the appendix for the derivation of the used formula. The initial monetary base was USD 13 500 million, which was the approximate value for February 2001, and the nominal GDP was USD 285 044 million, which was the GDP for 2000 in Argentina.

(2) The fields with a “-“ means that the PDVS could not be calculated using the formula derived in the

appendix because $\left| \frac{1+u}{1+i} \right| > 1$.

Source: Ministry of Economy, Argentina and own calculations

Figure 1
GDP at market prices
 (Constant 1990)

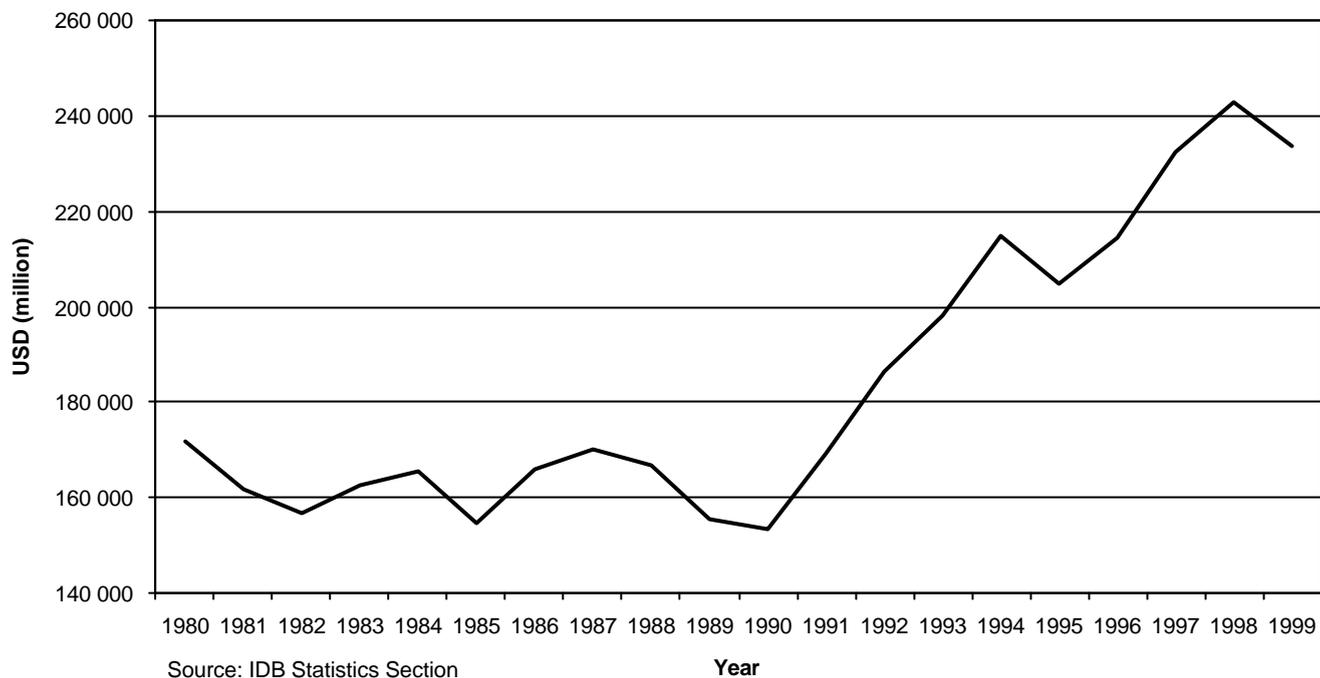


Figure 2
Inflation Rate
 based on the Consumer Price Index

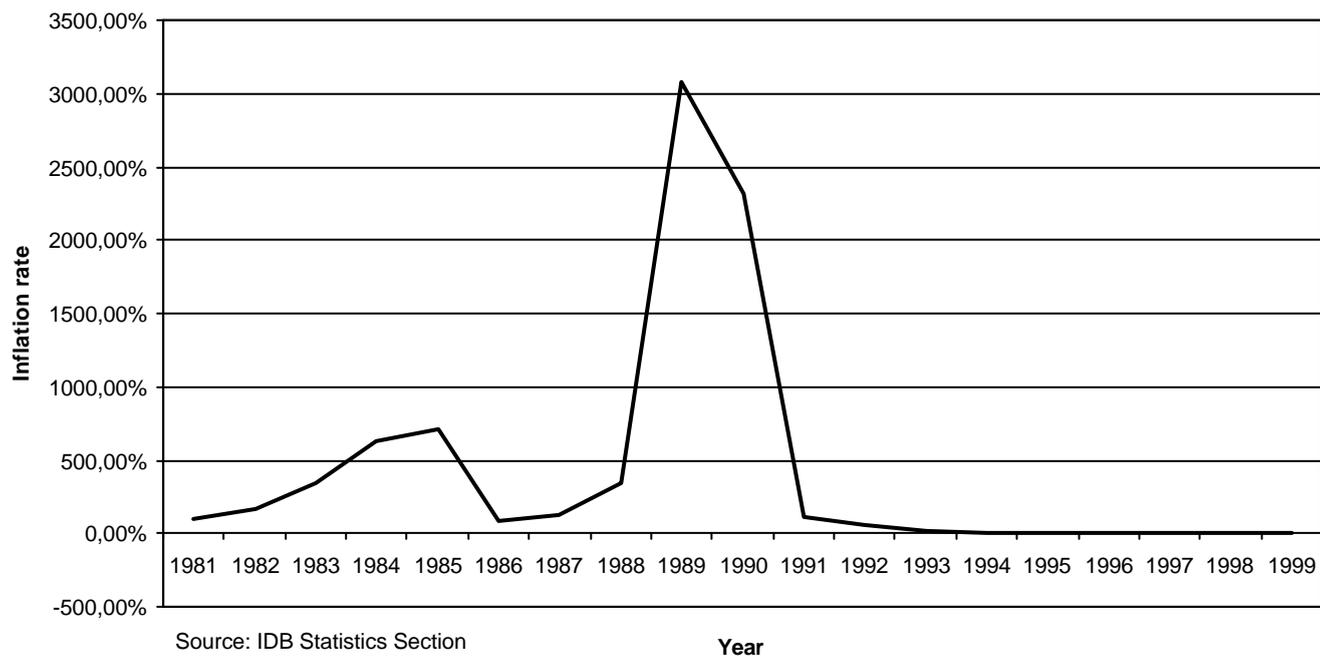
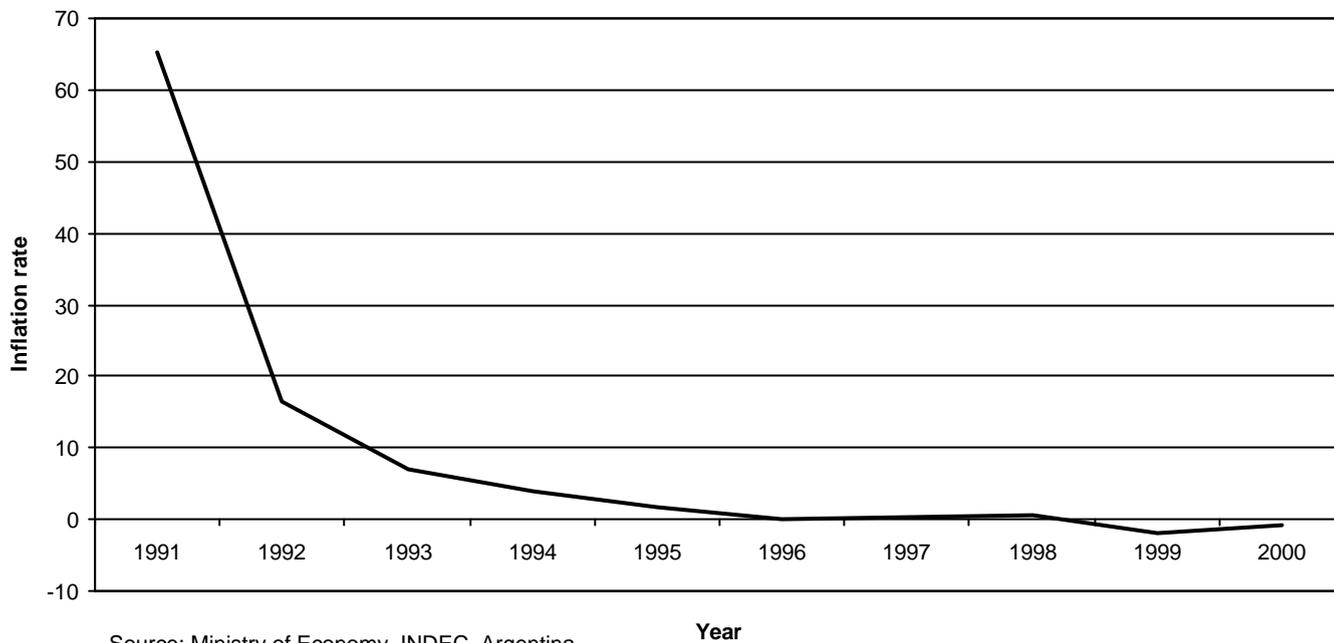
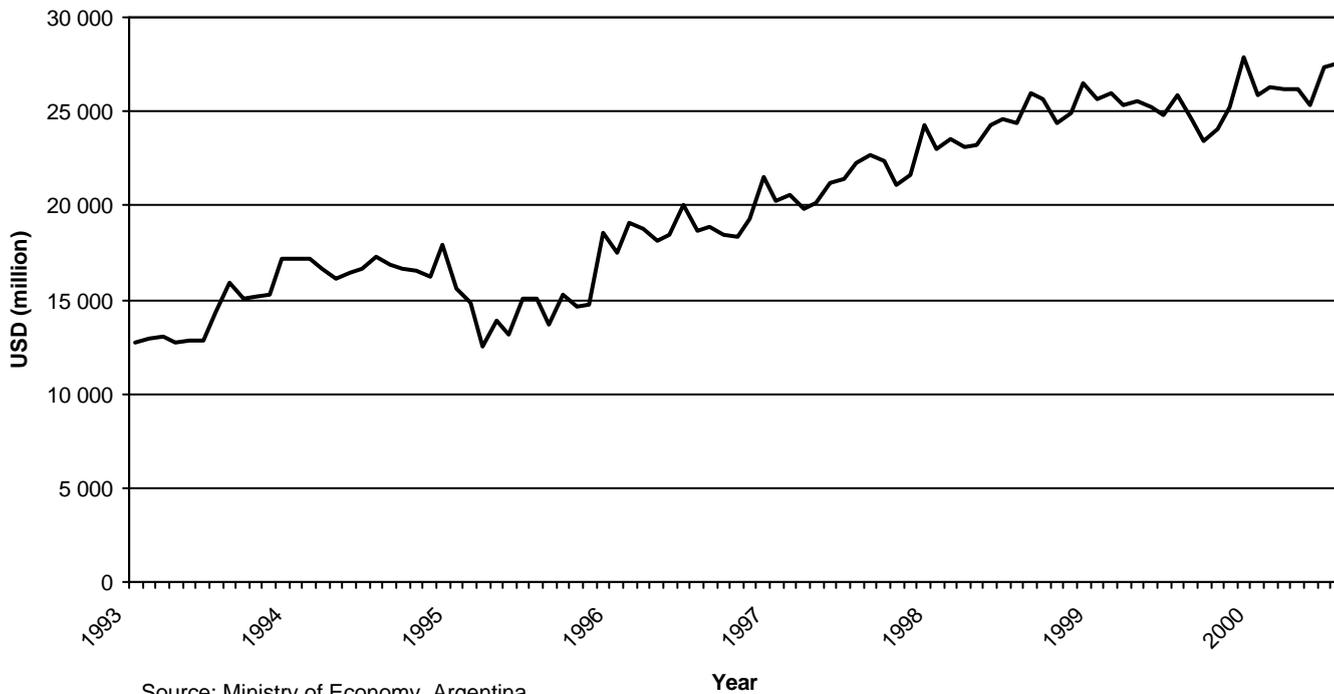


Figure 3
Inflation Rate
 based on the Consumer Price Index



Source: Ministry of Economy, INDEC, Argentina

Figure 4
International reserves of Central Bank



Source: Ministry of Economy, Argentina

Figure 5
Total Exports FOB

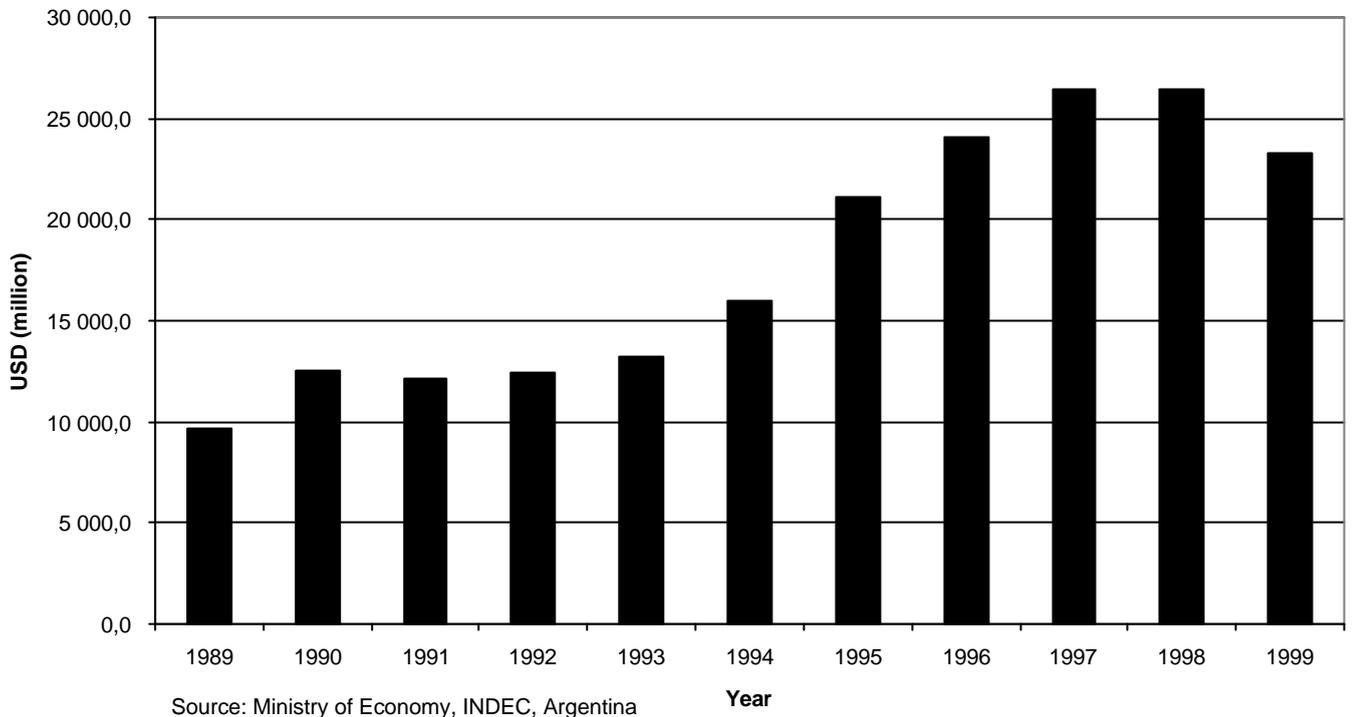
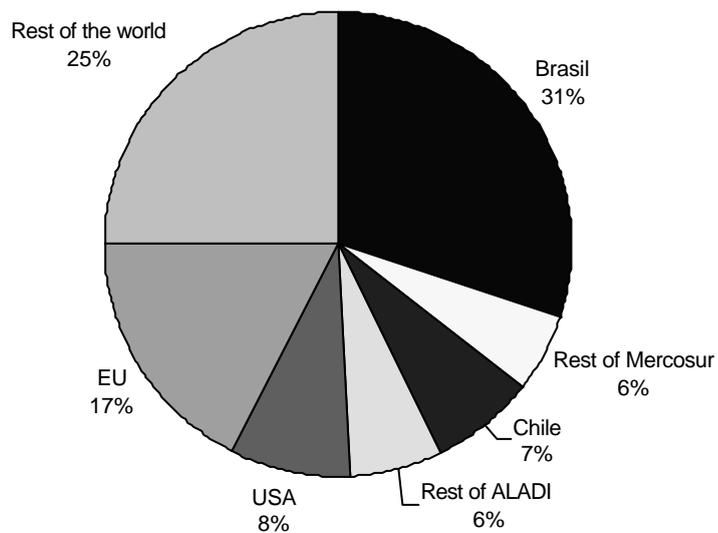


Figure 6
Destination of Argentine exports in 1998



Source: Ministry of Economy, INDEC, Argentina

Figure 7
Total Imports CIF

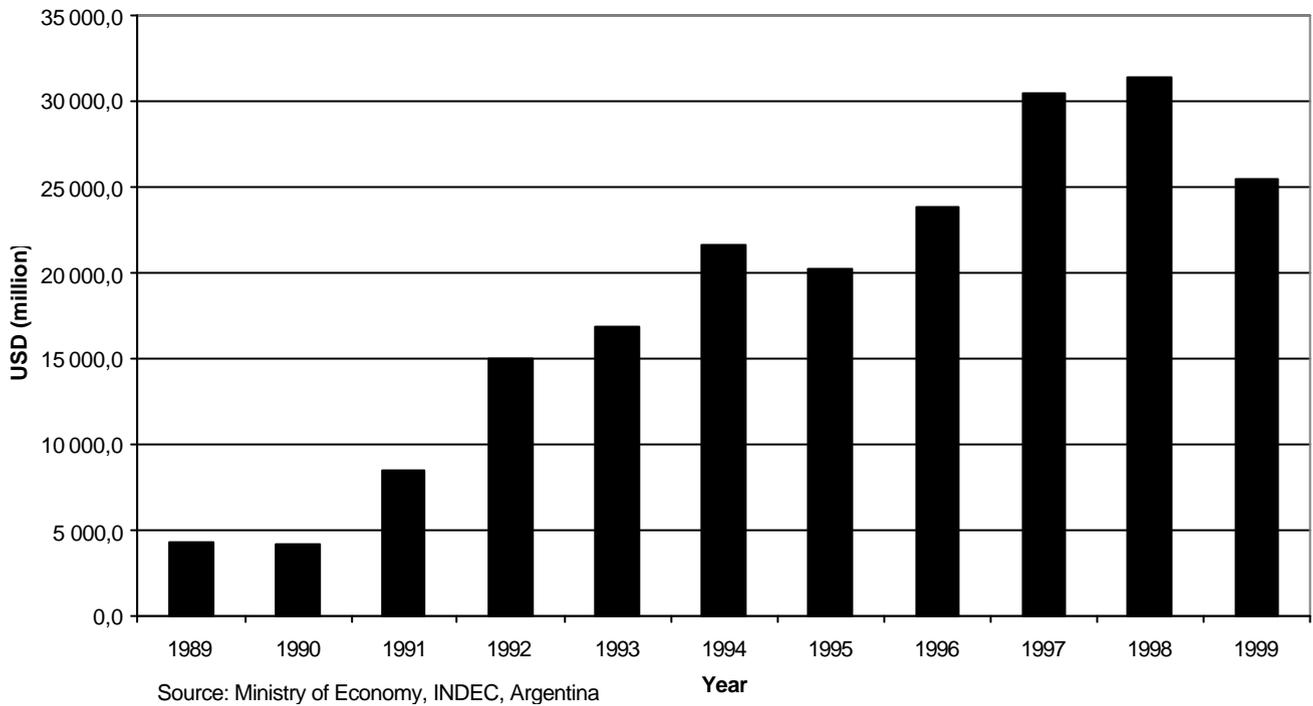
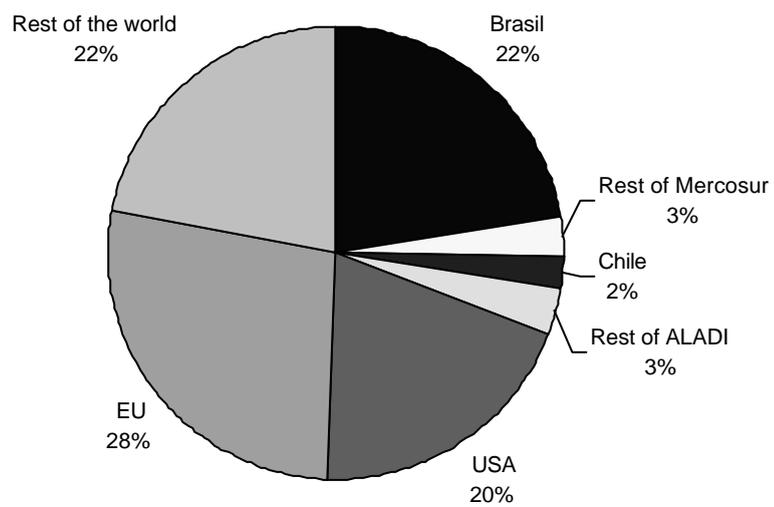
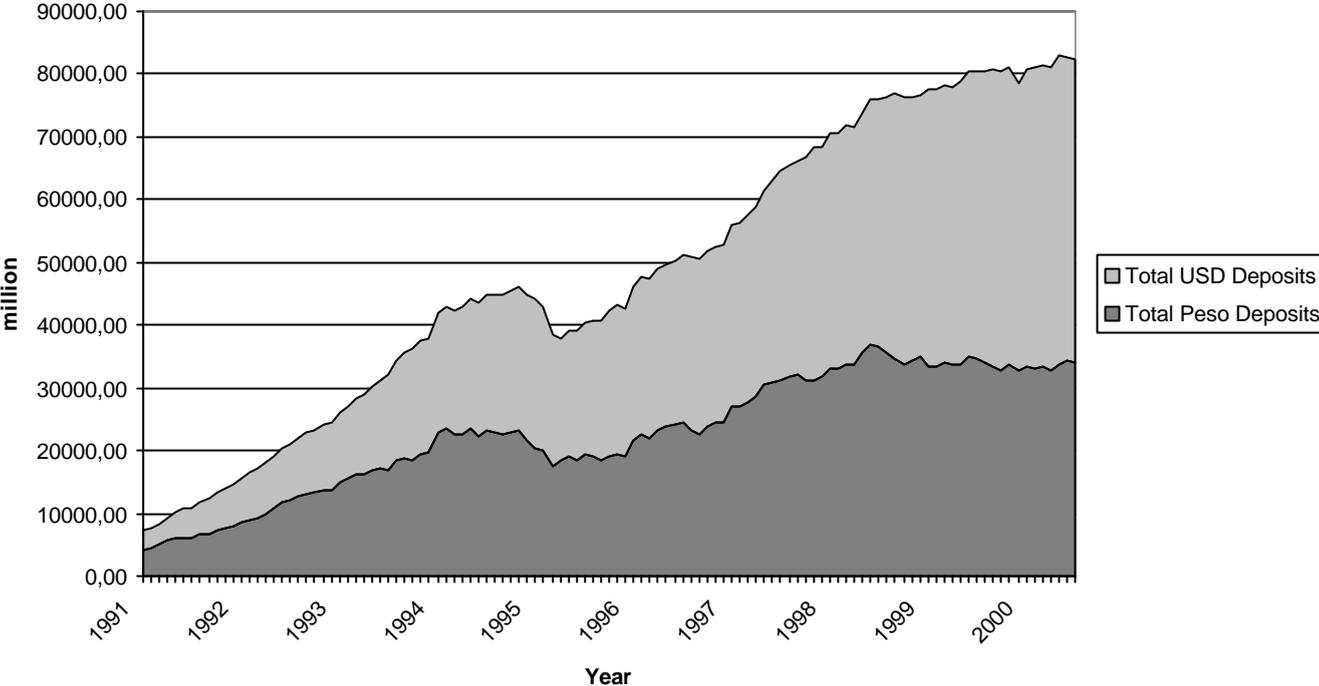


Figure 8
Origin of Argentine Imports in 1998



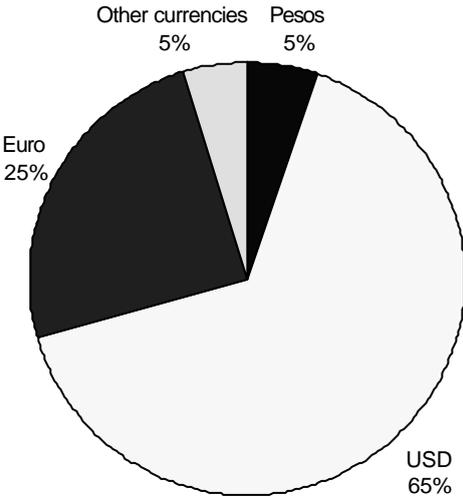
Source: Ministry of Economy, INDEC, Argentina

Figure 9
Total Peso and USD Deposits



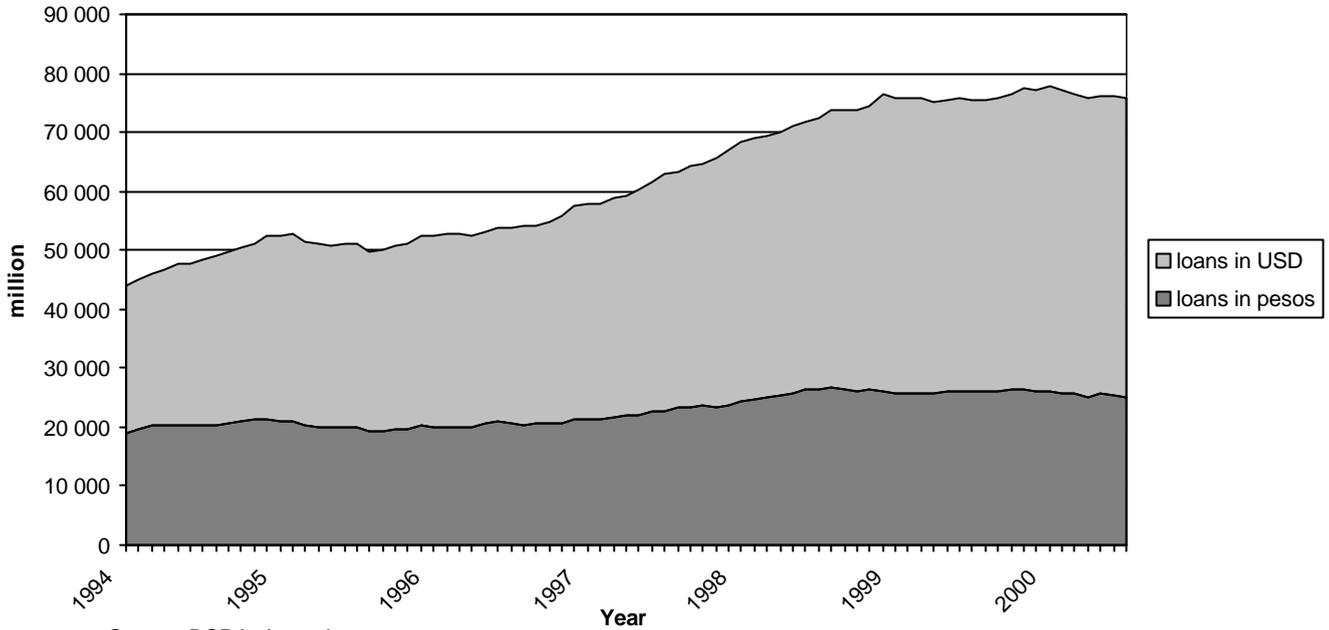
Source: BCRA, Argentina

Figure 10
Currency Denomination of Public Bonds
on 30/06/00



Source: Ministry of Economy, Argentina

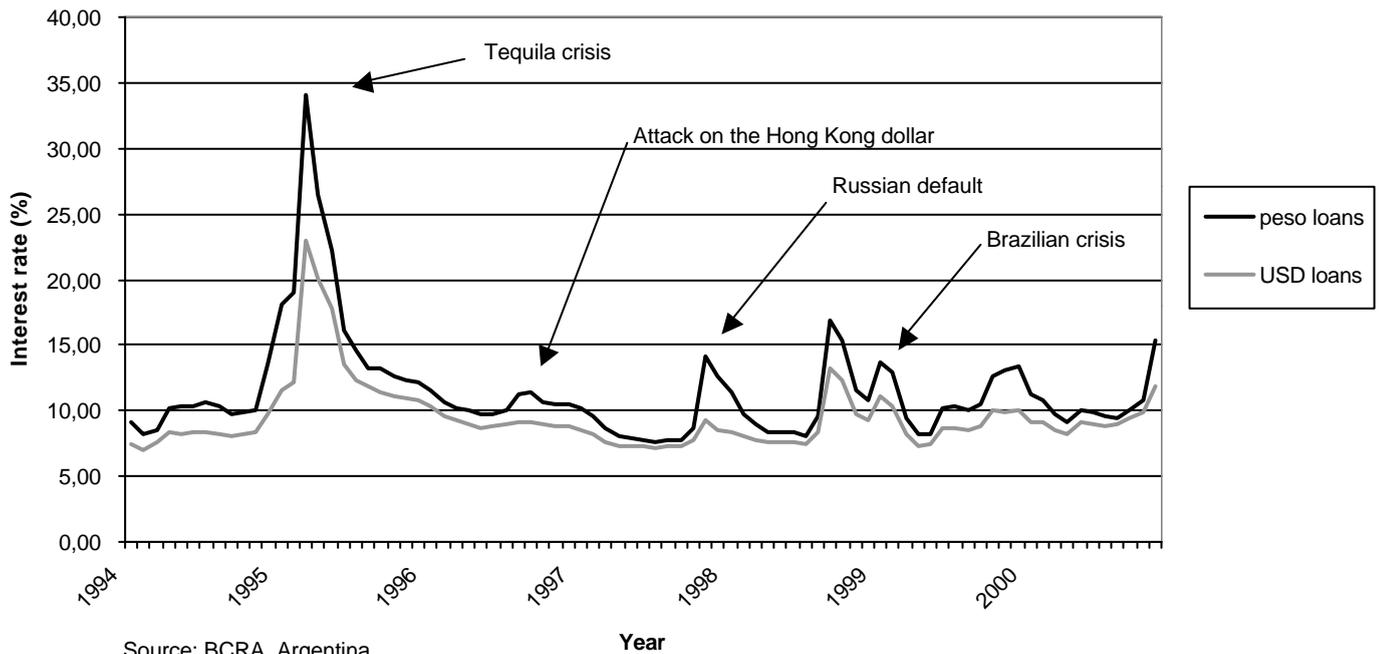
Figure 11
Loans from Financial Entities ⁽¹⁾



Source: BCRA, Argentina

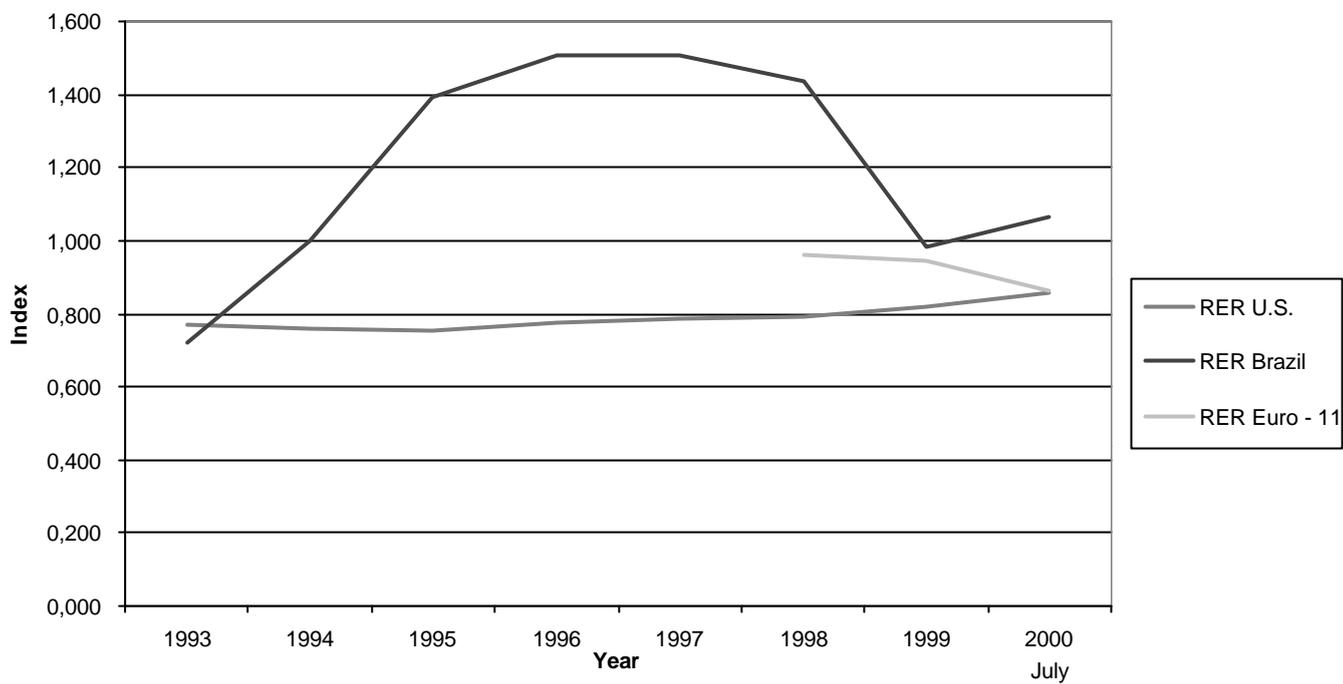
(1) Loans to the public sector (excluding public bonds) and to the private non-financial sector

Figure 12
Interest Rate on Loans
Granted to Prime Companies



Source: BCRA, Argentina

Figure13
Real Exchange Rate
Index based on the CPI ⁽¹⁾



(1) Base April 1991 = 1 for U.S. and Brazil, and Base January 1998 = 1 for Euro -11
 Source: Ministry of Economy, Argentina

Appendix: The Present Discounted Value of the Seigniorage Revenue

Following Gros (1993) and Schmitt-Grohé and Uribe (1999) the derivation of a formula for estimating the present discounted value of the seigniorage revenue is presented here. Lets assume, for simplicity, that the inflation rate \mathbf{p}_t and the domestic real growth g_t are constant over time and equal, respectively, to \mathbf{p} and g . If we also assume that the currency in circulation/nominal GDP ratio is constant over time, then the currency in circulation will be growing at the rate $(1 + g)(1 + \mathbf{p})$. Then the money holdings would be expressed by equation (A.1).

$$C_t = (1 + g)(1 + \mathbf{p})C_{t-1} \quad (\text{A.1})$$

Equation (A.1) can also be expressed as equation (A.2) if one takes into account the money holdings t periods back in time.

$$C_t = [(1 + g)(1 + \mathbf{p})]^t C_0 \quad (\text{A.2})$$

Using the opportunity cost measure of seigniorage expressed in equation (7.1) and assuming that $i = i_r$, the present discounted value of the seigniorage income, $PDVS$, is given by equation (A.3).

$$\begin{aligned} PDVS &= \sum_{t=0}^{\infty} \left(\frac{1}{1+i} \right)^t i C_t \\ &= \sum_{t=0}^{\infty} \left(\frac{1}{1+i} \right)^t [(1 + g)(1 + \mathbf{p})]^t i C_0 \end{aligned} \quad (\text{A.3})$$

Letting $(1 + g)(1 + \mathbf{p}) = (1 + u)$ and considering that an infinite geometric series $\sum_{t=0}^{\infty} ak^t = \frac{a}{1-k}$ if $|k| < 1$, the present discounted value of seigniorage can be rewritten as equation (A.4).

$$PDVS = \frac{1+i}{i-u} i C_0 \quad (\text{A.4})$$