Argentina 1990-1995:
A macro-economic model*

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The aim of this paper is to examine the behaviour of the economic aggregates of the Argentine economy in the period 1990-1995. This period shows interesting features since an economic program was put in motion in 1990 and was definitely consolidated in the first quarter of 1991. The program put forward by the Minister of the Economy Domingo F. Cavallo produced important transformations in the economy. It was based on the reduction and restructuring of the size of the public sector, on reforms of the Federal government and of the monetary authority. It brought inflation to a halt, and opened to a situation of improving the market mechanisms implying an increase in credibility and confidence on the Argentine economy. A period of rapid privatization and public sector divestitures went on with increasing external confidence and important inflows of international capital.

The examination of the behaviour of the main macroeconomic variables is centred upon the construction of a simulation model that will serve for descriptive purposes. This model represents an earlier stage of a wider research that the author is doing with respect to the Argentine economy. In this sense the model included in this paper does not intend to be a final version of the analysis but it suffices to cover the purposes above mentioned.

The Model

A model for Argentina was developed on the usual IS-LM lines. The idea is to determine the aggregates and the real rate of interest endogenously. The model considers mainly external sector forces as exogenous. This refers to exports that affect directly total demand for goods and services and autonomous external capital flows that affect the money base and therefore the quantity of money. This conception stems from the fact that in the period under analysis Argentina has undergone a process of continuous inflow of foreign capital because of raising credibility of foreign investors.

The strong stimuli of external sector through the current account and capital accounts both in the goods and services and the money markets take place under conditions of fixed exchange rate. Therefore the price mechanism was essential in the adjustment process of quantities.

Another feature of the model was to treat consumption and investment without discriminating into public or private aggregates. There are two reasons for that. Firstly, the national accounts recently published did no separate those entities, and secondly, in a period of state reform where a process of reallocation of resources is taking place both in the public and private sector, it is possible that a certain degree of crowding-out could prevail. Then, it seems more appropriate to rely on external impacts and avoid treating explicitly the domestic trade-off between public and private expenditures.

Sometimes, one could be tempted to consider increases in public investment to have an analogous impact on demand like an increase in exports. However, one has to be careful because there may be other reactions, producing crowding out, which are not explicitly contemplated in the model. Assuming changes in an exogenous variable may imply further assumptions to keep other exogenous variables constant. For example an autonomous

increase in the volume of exports, other things being constant, may imply increases in the quantity of money, via increase in foreign currency reserves.

For this analysis, a linear model was computed for Argentina on the basis of national accounts data for the period 1990-1995. Instrumental variables/two-stage least-squares (IV/2SLS) method was applied to estimate the equations[1]. The calculations were done by using the computer program PC-GIVE (Generalized Instrumental Variables Estimators), version 7, J.A., Doornik and D.F. Hendry (1992).

The endogenous variables are: gross domestic product or equivalently income (Y_t), aggregate consumption (C_t), investment (I_t), imports (M_t), and the average monthly real rate of interest (r_t). A subscript t denotes the current quarterly period and the aggregates magnitudes are in thousands of constant Argentine pesos (AR$) of 1986. The real exchange rate computed for 1986 was AR$ 1.228 to the US dollar. That rate is adjusted for changes in wholesale prices in both countries[2].For instance, quarterly income can be expressed in annual terms by adding the values of each quarter in a year.

Predetermined variables are: gross domestic product and consumption of the previous period, Y_{t-1} and C_{t-1}, current exports (X_t), the quarterly variation in the real quantity of money depicted by M3 in real terms (ΔM3/p), the continuous quarterly rate of increase in prices ($\Delta \ln p_t = qinf_t$), the ratio of export prices to import prices, that is, the terms of trade in quarter t (tot_t) and the average monthly short-run real interest rate in the previous quarter (r_{t-1}).
Data were collected from official sources such as the Ministry of the Economy, National Board of Statistics, and from private publications and reports of ECLA's office in Buenos Aires. A detailed description of data sources is provided in the Appendix A.

The 2SLS estimates of the structural system are shown in the Eqs. (1) to (5) below:

$$C_t = 0.64008\ Y_t + 0.2081\ Y_{t-1} + 0.26525\ \Delta M3/p - 55.284 \qquad (1)$$
(0.072444) (0.065551) (0.089574) (87.743)

s= 49.1942 ; DW = 0.909 ; RSS = 48401.47 ; reduced form **s=**85.86
Specification $CHI^2(4)/4=4.345$; Test **b** = 0:$CHI^2(3)/3= 290.68$

$$I_t = -290.91\ r_t + 0.47407\ C_{t-1} - 545.08 \qquad (2)$$
(146,64) (0.035005) (82.083)

s = 53.6863 ; DW = 2.29 ; RSS = 60526.497 ; reduced form **s=**51.0285
Specification $CHI^2(5)/5=1.6843$; Test **b** = 0:$CHI^2(2)/2= 99.366$

$$M_t = 0.39754\ Y_t + 0.42246\ tot_t - 789.98 \qquad (3)$$
(0.061012) (0.95040) (106.66)

s = 57.9525 ; DW = 2.16 ; RSS = 70528.317 ; reduced form **s =**22.83
Specification $CHI^2(5)/5=3.3493$; Test **b** = 0:$CHI^2(2)/2= 72.973$

$$Yt = Ct + It + Xt - Mt \qquad (4)$$

$$r_t = 5.403e\text{-}005\ Y_t - 0.49142\ r_{t-1} + 0.23366\ qinf_t - 0.00019334\ (\Delta M3/p) - 0.15928 \qquad (5)$$

(3.753e-005) (0.10507) (0.073133) (0.00011431) (0.11752)

s= 0.028942 ; DW = 1.35 ; RSS = 0.015915 ; reduced form **s=**0.0239
Specification $CHI^2(3)/3=3.0561$; Test **b** = 0:$CHI^2(4)/4= 38.989$

The figures between brackets are the standard errors of the coefficients. The $CHI^2(k-1)/(k-1)$ test for **b** = 0 (excluding the intercept) is similar to testing for the significance of the coefficient of determination,R^2. CHI^2 statistics standarized by (k-1) above, has approximately an $F(k-1,\infty)$ distribution (Doornik and Hendry).

Table I
Estimated Endogenous Variables. Argentina 1990-1995

Period	Estimated Variables (thousands of 1986 pesos)				
	Y_t	C_t	I_t	M_t	r_t
I 1990	2094.3	1637.1	258.1	79.0	0.343247
II	2271,8	1842.1	264.2	148.0	-0.07272
III	2356.0	1947.4	281.3	187.2	0.077081
IV	2419.7	2005.6	350.2	211.3	-0.00266
I 1991	2429.1	2008.7	393.7	207.0	0.043237
II	2415.5	1964.8	344.6	202.0	0.002088
III	2654.5	2199.4	443.7	305.2	0.005797
IV	2653.1	2212.0	482.2	303.8	-0.02664
I 1992	2739.0	2282.9	542.9	332.6	-0.02269
II	2736.4	2249.7	511.2	331.6	-0.01931
III	2981.7	2490.2	617.9	434.1	-0.00865
IV	2924.0	2428.9	621.6	410.6	-0.00713
I 1993	2862.2	2397.1	600.7	400.9	-0.03085
II	2805.2	2311.8	553.3	377.9	-0.01336
III	3036.6	2549.9	660.9	472.4	-0.00983
IV	3078.1	2575.0	701.0	488.3	-0.00436
I 1994	3068.7	2582.1	687.9	483.4	-0.01911
II	3075.1	2530.9	669.5	487.4	0.00997
III	3287.4	2751.0	752.5	572.0	0.01608
IV	3277.2	2733.5	752.8	567.4	0.020501
I 1995	3191.6	2636.0	717.4	533.5	0.041183
II	3219.0	2624.8	650.2	544.6	0.025496
III	3171.8	2643.6	640.0	525.8	0.004702

IV	3108.5	2568.7	646.8	499.8	0.007838

Table I contains the estimated values for the endogenous variables in the sampling period 1990-1995. Actual values for those variables and exports are presented in the Appendix A. The estimates of table I were made by considering actual values for the lagged endogenous variables.

The market of goods and services

The equations corresponding to the goods and services market are commented as follows,

(a) The consumption function

Structural equation (1) corresponds to the consumption function. It shows total consumption depending positively on income of the current and previous period and also upon the present change in the real money balances. An increase in the quarterly income determines an increase in consumption distributed in the following way: three fourths in the current quarter and one fourth in the next. This lagged influence becomes smaller when income is considered at an annual basis.

Another relevant variable influencing consumption is the quarterly increase in the quantity of money, or in other words, the current change in real money balances. This variable refers to transitory changes in consumption. This kind of relationship assumes that excess balances are derived to a transitory greater demand for consumer goods. This situation will generate an increase in consumption in the present. In so far as money balances do not increase in the following period, then ceteris paribus, consumption expenditures will contract and come back to the previous level. Summing up, in a context where price stability and convertibility prevail, the variations in real money balances are regarded as unanticipated. It lasts whenever exists surprise.Whether the real balances keep unchanged in the following period, the motivation for an increase in consumption disappears.

The lagged influences of income naturally affect the saving function. Saving depends on both current and past income. However, the structural equation system involves equilibrium in a short run sense, for instance in a quarter. This equilibrium will be modified in the following quarter because of further lagged effects. Therefore, equilibrium in a quarter does not imply that the economy is at rest. Forces in motion are operating in subsequent periods to determine a full equilibrium in the long run. Dynamic multipliers describe the impact in future periods. Different lag structures in the behaviour functions are interrelated by the way they affect the equilibrium in the current quarter. Present endogenous variables are determined by their simultaneous influence and the effects coming from their past values.

The consumption function presents autocorrelated residuals. The Lagrange Multiplier test for residual autocorrelation from lags 1 to 2 is done with the statistic $CHI^2(2)/2= 3.7379$. It rejects the null hypothesis that there is no autocorrelation at the 5% level of significance, though it is accepted at the 1% level. Further testing accepts the null hypothesis of non existence of an ARCH structure in the residuals and of non heteroscedastic errors.

(b) The investment function

The investment function (2) shows an expected negative coefficient with respect to the short-run real rate of interest. However, this coefficient is very close to the critical value in the t-Student table but is not enough to reject the null hypothesis. The other coefficients are very meaningful. Investment reacts positively with the consumption expenditures of the previous quarterly period. In addition, this function does not reject the hypothesis of validity of instruments (Sargan test) at the 5% level of significance.

Testing for residual autocorrelation, $CHI^2(2)/2= 0.86661$ accepts the null hypotesis of non autocorrelation. There are neither ARCH nor heteroscedastic residuals.

(c) The imports function

Equation (3) depicts imports as a function of current income and the ratio of current price of exports to price of imports indexes. The model assumes constancy of the exchange rate. This is true since the second quarter of 1991. Any previous change in the rate of exchange will be mixed with price variation included in the movement of the terms of trade. In the structural equation the coefficient of the terms of trade is not significantly different from zero. No residual autocorrelation has been found. $CHI^2(2)/2= 0.56777$. On the other hand, validity-of-the-instruments test permits to reject the null hypothesis.

(d) Output

Equation (4) is an accounting identity that defines the gross domestic product in terms of the previous variables. This model does not include explicit constraints on the aggregate supply and employment. In this sense it can be considered a model of pure demand behaviour. This was deliberately done. The period under analysis is a period of deep structural transformations. State reform and reallocation of resources among activities introduce serious impacts in the measure of productivity and demand for labour. Moreover, the impact of supply constraints on the general price level are very difficult to be measured. That is why, it was decided to construct a demand-model and introduce supply restrictions on its use through adequate simultaneous handling of exogenous variables.

The money market

The structural equation (5) implies equilibrium in the money market. It relates the current real rate of interest to its previous period level, to real income, to the rate of change in prices and to the change in the quantity of money. In this model equilibrium has been presented in flow terms. This specification was adopted after a series of unfruitful attempts to estimate the LM curve with all variables in their levels.

Thus, equilibrium implies equality between quarterly variations in demand and supply of money in real terms respectively. Linearity has been assumed to prevail in the relationships of flow variables for the money market. This is a somewhat reduced equation for a LM function. The signs of coefficients are consistent with economic theory. The qinf variable reflects the current quarterly price increase rate and influences expectations regarding innmediate future course of price evolution. This affects positively the demand for money. The corresponding coefficient is positive and significantly different from zero.
Validity of specification is accepted at the level of 1% but rejected at the 5% level.

It is assumed that demand and supply in the money market as stocks are constantly adjusting themselves and short-run equilibrium is defined by equality in flow terms. That is, equilibrium is denoted by the equality between the excess demand for liquidity over the supply(equal to demand) of the previous period.

In symbols, equilibrium in the money market in period t is denoted by,

$(M3/p)_t = L_t$

$(M3/p)_t - (M3/p)_{t-1} = L_t - (M3/p)_{t-1} = \Delta\ (L/p)$

where Δ (L/p) is the excess demand for money over the supply of the previous quarter,

then, equilibrium implies

Δ (L/p) = Δ (M3/p) for each period. Equality is attained with the corresponding adjustment of the real rate of interest.

$\Delta\ (L/p) = a\ Y - b\ r - b_1\ r_{t-1} + c\ qinf_t - k$

Given the values of Y_t, r_{t-1}, and $qinf_t$, for the sake of simplicity, r_t depends on the change rate of money supply(ΔM3/p). Steady changes imply constancy of the interest rate at the particular level. There is a critical rate of interest, r*, at which demand for money keeps invariable, and this prevails when the supply of money is constant, that is, when (ΔM3/p)= 0. If money grows (declines) the interest rate falls (rises). The stock concepts of money demand and supply can be traced by adding flows in each period.

This stepwise formation of money balances seem to be characteristic of the period under observation.

As far as (ΔM3/p) varies in every period the rate of interest will move. Changes in the quantity of money produce only short-run modifications in the rate of interest. However, changes in output can produce long-run changes in the equilibrium of the money market thus affecting the interest rate. This asymmetry emerges from the peculiar behaviour of demand and supply. Constancy,in the rythm of change in the quantity of money implies an infinitely elastic demand for money in the long period. the inflow of money is absorbed continuously by demand without alteration of the interest rate.

The fact that the rate of interest be determined by a smaller flow demand than the existing stock, requires the usual explanation from the economic theory. At a given time there is a stock of money. Economic agents can be holders or non holders of money. So total demand includes demand from non holders and demand from holders (reservation demand in the sense of Wicksteed)[3]. Anyone can be a demander or supplier depending on the opportunity cost of holding money balances. This peculiar behaviour similar to the one prevailing in the stock market can be reinforced by the convertibility setup where the central bank has no autonomous role in determining the money supply. Money is introduced to the system by exchange of foreign currency. Later, it changes of hands among economic agents according to their preferences.

In addition, the model does not require a clear specification of demand for money function. The equation estimated by IV/2SLS can be regarded as a reduced equation of the substructural system provided by the money market. This equation is sufficient to relate income to the real rate of interest.

$$\Delta(L/p)_t = 0.279456\ Y_t - 5172.24\ r_t - 2541.74\ r_{t-1} + 1208.55\ qinf_t - 823.84$$

At first sight, the pegged exchange rate turns monetary policy to be passive and the quantity of money is determined by the overall impact of the balance of payments situation. In this model all external factors are considered exogenous, therefore the quarterly changes in the quantity of money are also considered exogenous.

The impact of the short-run real rate of interest on the demand for money lasts two periods. Professor Julio H.G. Olivera kindly suggested me to analyze whether the coexistence of different lagged variables in the model could imply violations to the Walras Law or non optimal decisions from economic agents. My view is the following:

The consumer in time t choses the combination of goods that maximizes its utility function according to the budget constraint, but trying to adquire a given amount of goods decided a period earlier. In so far as the maximum-utility combination does not contradict the consumption figured out in t-1, there are no problems regarding the final equilibrium position. On the other hand, if it contradicts it, that is, the predetermined consumption is larger than which maximizes income there appears an inconsistency: either the predetermined consumption persists and the consumer is not rational, or the consumer is rational and gives up predetermining the consumption

The smaller is the predetermined effect, the higher the probability that lags are consistent with the utility maximization in t. This, is the case of the present model. In consumption the incidence of previous period income is 25% of the total effect. In demand for money, the impact due to the previous period interest rate is a 33% of the total interest effect.

Furthermore, the existence of lags in some behaviour functions of this empirical model refers to the lack of perfect information with respect to certain variables. Therefore, different lagged variables can coexist as devices for predetermining decisions that at last take place at the current existing prices. The problem of inconsistency of lag structure is possible but they can be ruled out in so far their effects are not important. Lags in demand for goods correspond, in time and effect, to the lags in the demand for money. In each period the budget constraints are observed and decisions are consistent with utility maximization.

The money equilibrium function does not present autocorrelated residuals. A Lagrange Multiplier test for residual autocorrelation from lags 1 to 2 is $CHI^2(2)/2 = 1.2543$. It does not reject the null hypothesis of non autocorrelation at the 5% level of significance. There is not an ARCH structure in the residuals but testing rejects the hypothesis of non heteroscedastic errors. Validity of the instruments is accepted at 1% level but not at 5% level.

Short-run versus Long-run

By definition, the model describes short-run behaviour. Notwithstanding, it is interesting to know if some of its structural equations can survive in the long period. Therefore, some unit-

root tests have been done to determine the order of integration and the cointegration of the residuals of the structural equations of the model. The cointegration analysis has been done on individual functions. The aim was to evaluate each separately and not as a model. The tables of the critical values of the DF and ADF statistics used are provided by Charemza and Deadman (1992).

According to the Dickey-Fuller test most of the variables are integrated of order one. Y_t, C_t, I_t, X_t, M_t, tot_t ~ I(1) and,

r_t, $(\Delta M3/p)_t$, $qinf_t$, ~ I(0)

The values of the Dickey-Fuller statistic and the Augmented Dickey-Fuller statistic are shown in the Appendix B.

Cointegration Tests on the residuals of the model equations.

In the long run, there may be series that, though trended, evolve closely together and their linear combination may be stationary. Therefore, they are cointegrating variables. A particular relationship estimated based on a sample may persist in the long run because they are cointegrating variables. By the way, some tests have been done to evaluate the posibility of cointegration for every structural equation of the model. When there exists cointegration the relationship can be supposed to persist in the long run and the series will move around the estimated long run values given by the estimated relationship [Engle, R.F. and Granger, C.W.J.(1987) and Cuthbertson et al.(1992)].

(a) Demand for Consumer Goods

According to the analysis of the order of integration, the consumption function depends on two variables ~ I(1) and one variable ~ I(0). The structural coefficients vector (excluding the intercept) is not a cointegrating vector and therefore the residuals u_t ~ I(1). The Dickey-Fuller statistics are computed. Since the long run structural coefficients were not known and they had to be estimated (number of coefficients estimated =3)the critical values of statistics become more restrictive. (Tables with m = 3)(See Charemza and Deadman).

DF= -2.699 DW(û)= 0.6751 ADF(û)= -2.495 ADF(û)= -1.771

The null hypotesis of no cointegration cannot be rejected. This result is expected since the present specification is clearly a short-run function. This is apparent from the lagged income and $(\Delta M3/p)$. Both effects on current consumption are definitely short run effects. If the specification of the consumption function is changed to $C_t = \mathbf{b}_1 Y_t$ estimated by IV/2SLS, then cointegration reappears[4].

(b) Demand for Investment Goods

The investment function represents a linear combination of two variables with unit order of integration and one variable of zero order. The number of coefficients estimated is 2. According to the following statistics,

DF = -5.426 DW(û) = 2.278 ADF(û)= -2.577 ADF(û)= -2.883

only the DF rejects the null hypothesis of no cointegration at the 1% level of significance.

(c) Demand for Goods from Abroad

Here, the import function is a linear combination of three variables of unit order of integration. The test on the residuals permits to reject the hypotesis of no cointegration at the 1% level if the DF is chosen, or at the 5% level based on the two versions of ADF. The number of coefficients estimated is 2, and the statistics are,

DF = -5.453 DW(û) = 2.121 ADF(û)= -4.075 ADF(û)= -3.813

(d) Gross Domestic Output

A test was done on the residuals emerging as a difference between the actual data and the values fitted by the model. Since the coeficcients of the equation (5) are known, one must enter the Table with m=0 (See Charemza and Deadman).

DF = -6.403 DW(û) = 2.593 ADF(û) = -3.639 ADF(û) = -4.066

All variables individually are I(1) and the cointegrating vector is [1,-1,-1,-1,1]. The null hypothesis of no cointegration is rejected at the 1% level of significance from any Dickey-Fuller statistic listed above.

(e) Real Rate of Interest

Here lack of cointegration is clearly stated. It is very interesting to see that in the equation of the equilibrium in the monetary market of the estimated model, the variables are all integrated of order 0 except the real income that is integrated of order 1. If there were a possibility of cointegration there must be at least one more variable of unit order of integration. Therefore cointegration should be ruled out. The residuals are integrated of order one implying that it is non stationary.
The number of coefficients estimated is 4 and all statistics listed below

DF = -3.578 DW(û) = 1.237 ADF(û) = -3.096 ADF(û) = -1.837
show that the null hypothesis cannot be rejected.
Another way to see this is that the flow equilibrium equation for the monetary market is particularly a short-run function and cannot be conceived to keep constant its coefficients in the long run. In this sense the particular specification of the demand for money in this model, is unstable.

The treatment of equiibrium in the money market specified in the model construction defines strongly the model behaviour as a short-run model.

The Simulation Process

The impact multipliers emerge from the coefficients of the reduced form of the model. The factors determining the endogenous variables from outside can be grouped in the following categories: (a)past evolution of domestic economy, particularly in total consumption and income; (b) direct external impact trough demand for the country's exports and terms of trade;

(c)indirect external impacts over the monetary market through changes in the size of that market; and (d) the influence of present quarterly domestic price change and the real rate of interest in the previous quarter.

Table II

Coefficients of the Derived Reduced Form

Exogenous Variables Variables	Endogenous Variables				
	Y_t	C_t	I_t	M_t	r_t
Y_{t-1}--	0.269149	0.380377	-0.00423	0.106997	1.45E-05
C_{t-1}	0.613145	0.392462	0.464433	0.24375	3.31E-05
X_t	1.293363	0.827856	-0.02033	0.514164	6.99E-05
tot_t	-0.54639	-0.34974	0.008588	0.205246	-3E-05
$\Delta(M3/p)_t$	0.415809	0.531401	0.049709	0.165301	-1.71E-04
$qinf_t$	-87.9151	-56.2727	-66.5922	-34.9498	0.22891
r_{t-1}	184.8979	118.3495	140.0528	73.50433	-0.48143
Constant	305.1719	140.0504	-503.541	-668.662	-0.14279

The next step is to determine how the model fits the evolution of the endogenous variables in the sampling period 1990-1995. In the figure 1 every endogenous variable is depicted in both actual and fitted values. To have a measure of the prediction error in the sampling period a root-mean-square simulation error as a percentage of the average value of the variable, in other words, a corfficient of variation V[5].

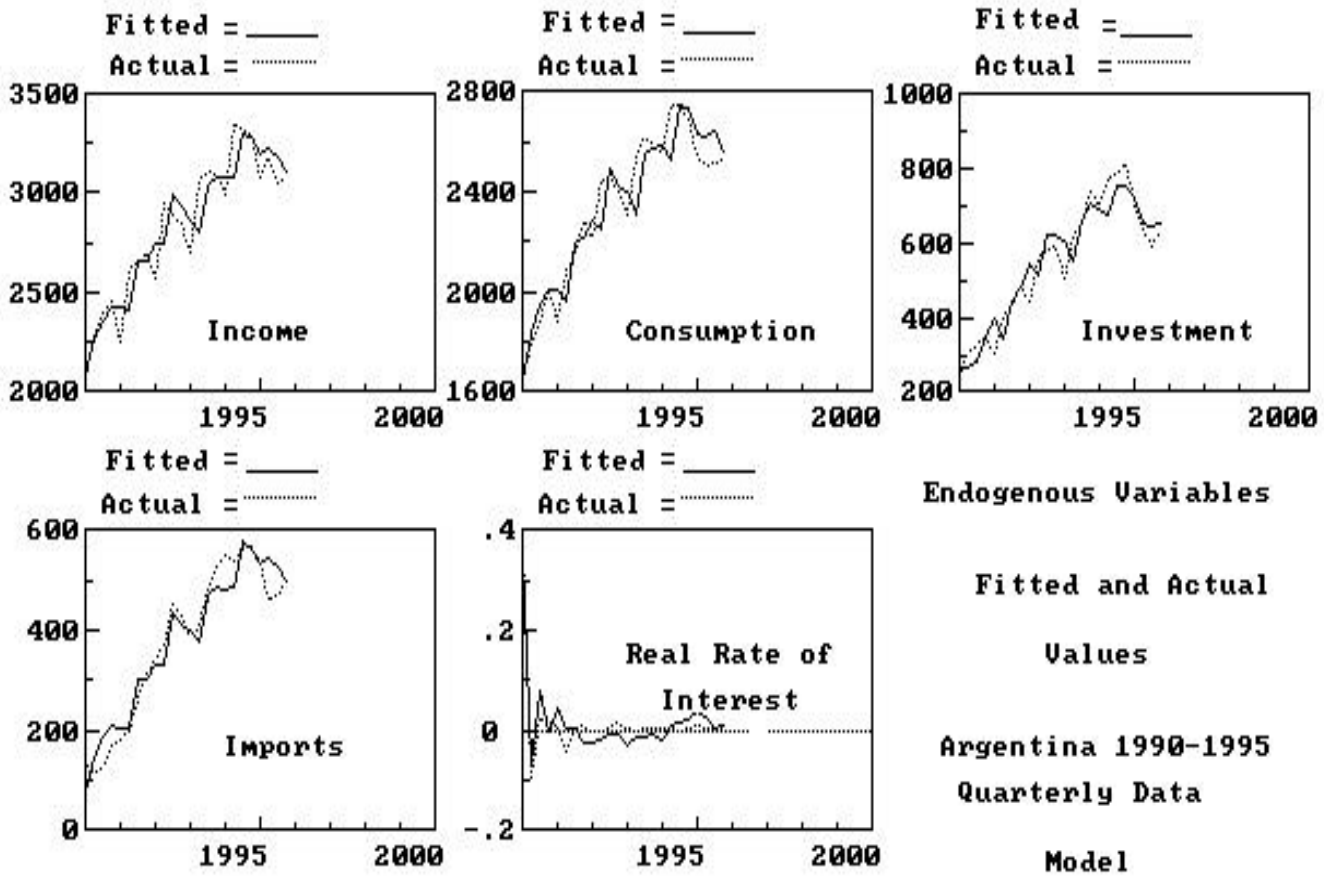

Fig. 1

A second version of the model was computed under the same lines but with the inclusion of dummy variables for seasonality. This new version is denoted by M2, while the original and previous version is M1 and whose derived-reduced-form coefficients are shown in Table II. The structural coefficients of the model are in Appendix C. The model version with seasonality loses some degrees of freedom and was included for comparative reasons.

In the M2 model each structural equation presents the seasonal dummies except in the consumption equation. Then the original specification was maintained since the seasonal

dummy variables altered considerably the income coefficients by producing some changes in sign.

However, the model with seasonal dummies (deterministic seasonality)is less efficient. This arises in the higher values of the simulation statistics in the Table below. The superiority of the M1 rests on that without explicit seasonality variables it better fits the data.

Table III

Simulation Statistics

	Root-mean-square errors			
	M1 Impact Simulation	M1 Historical Simulation	M2(Seasonality) Impact Simulation	M2(Seasonality) Historical Simulation
Y_t	127.0	150.0	219.6	201.2
C_t	101.6	123.3	157.7	151.1
I_t	51.8	78.7	89.3	94.5
M_t	38.0	63.5	36.4	73.2
r_t	0.024	0.022	0.211	0.214
	Root-mean-square percent errors			
Y_t	4.51	5.11	7.84	7.12
C_t	4.23	5.03	6.70	6.31
I_t	11.30	13.86	20.87	20.38
M_t	16.71	21.51	13.00	24.31
r_t	4486.60	1960.65	72180.30	72219.35
	Coefficient of Variation %			
Y_t	4.49	5.31	7.77	7.12
C_t	4.34	5.27	6.74	6.46
I_t	9.46	14.38	16.30	17.25
M_t	10.03	16.74	9.60	19.29
r_t	161.27	149.72	1409.03	1426.36

The table of simulation statistics shows that the model, in its original M1 form is comparatively better than the one incorporating explicit seasonal variables.

Impact and dynamic multipliers

The impact multipliers are the initial first-period change in the endogenous variables. Coefficients of the reduced form represent the impact multipliers produced in the current period. Once a change in an exogenous variable takes place, there is a change of other impacts in future periods due to lagged endogenous variables. So the initial changes distribute their influence in the following periods. Therefore the model has a dynamic behaviour that may be stable or not. The model is a system of difference equations that has a time path. First, it must be determined if this path is stable.

The system can be expressed as, $Z_0 = \mathbf{P_e}\, Z_{-1} + \mathbf{P_x}\, X_0 + \mathbf{pM_3}(\Delta M3/p)_0$, where Z_0 is the vector of endogenous variables in t=0, X_0 is the vector of exogenous variables in t=0[6], $\mathbf{P_e}$ is the 5x5 coefficient matrix of the reduced form corresponding to the lagged endogenous variables, $\mathbf{P_x}$ is the matrix of coefficients of the reduced form corresponding to the exogenous variables excluding $\Delta M3/p$ .The excluded coeficients are expressed in $\mathbf{pM_3}$. This is a 5x1 vector of the coefficients of the reduced form corresponding to the variable $\Delta M3/p$. The change in the quantity cannot persist in the long run, then it must be separated from the exogenous variables on their levels. This peculiarity implies that the model does not have monetary effects in real variables in the long period.

Eigenvalues of the matrix $\mathbf{P_e}$ are smaller than 1 in absolute value. Then the system is stable and it converges to long-run equilibrium values of the endogenous variables. The roots of the polinomial $|\mathbf{P_e} - \mathbf{l}\mathbf{I}| = 0$ are, $\mathbf{l}_1 = 0.82291$; $\mathbf{l}_2 = -0.48592$; $\mathbf{l}_3 = -0.15681$; $\mathbf{l}4 = 0$; and $\mathbf{l}_5 = 0$.

The sum of all dynamic multipliers is obtained as follows,

$$\lim_{t\to\infty} Z_t = \sum_{r=0}^{\infty} \mathbf{P_e}^{r}\, \mathbf{P_x}\, X_0 = [(I - \mathbf{P_e})^{-1}\, \mathbf{P_x}]X_0$$

since $\lim_{t\to\infty} \mathbf{P_e}^{t+1} = \lim_{t\to\infty} \mathbf{P_e}^{t}\, \mathbf{pM_3}\, (\Delta M3/p)_0 = \mathbf{0}$

The expression between brackets, $[(I - \mathbf{P_e})^{-1}\, \mathbf{P_x}]$, is a matrix of the sum of long run multipliers.

The values of these multipliers are shown in table IV.

Table IV

Long-run Total Multipliers

	X_t	tot_t	$qinf_t$
Y_t	6.34	-2.68	-288.82
C_t	5.37	-2.27	-245.00
I_t	2.48	-1.05	-158.67
M_t	2.52	-0.64	-114.82
r_t	0.00	0.00	-0.06

For example, one peso (AR$)increase in X creates a sum of dynamic multipliers equal to AR$ 6.34 increase in income in the long run. On the other hand, the impact multiplier is AR$ 1.29 as follows from Table II.[7] The model has low impact multipliers but high long run effects. Each change in exogenous variables sets forces in motion. However this model does not include constraint on the side of supply. In that sense, the model only takes into account changes in demand. Therefore, caution must be adopted and the supply restriction should be incorporated from outside. This implies to set limits to output expansion and include price rises in $qinf_t$, tot_t and changes in $\Delta(M3/p)_t$.

Again, the peculiarities of the money market assumed in this model behaviour arise. The dynamic multipliers are not affected by the original change in the quantity of money. If changes were persisting at any period at a fixed rate, the level of the endogenous variables would be strongly affected in the long run. If the changes in M3/p were positive it would be very expansive and the contrary would happen if the original change were negative[8]. Nonetheless, this hypotesis is untenable. Changes in the quantity of money have only short run effects in this model. Moreover, the effect of the expansion in real M3 holds only in the current period. Once it happened it vanishes next quarter. Therefore, there are no real effects in the endogenous variables. Demand for money is here very adaptative and this implies readjustment in the real rate of interest.

The Argentine economy in the period 1990-1995

One first point to establish is whether the economic orientation that took place in the 90's produced a significant transformation in the behaviour of the economy. This could be done with the help of the model, by trying to determine if structural coefficients changed meaningfully since 1990. For those reasons an analysis of variance was applied to test parameter stability in each function. Therefore the model was computed from data of two subsequent periods, that is, 1980[3] to 1989[4](38 observations) and 1990[1] to 1995[4](24 observations) corresponding to the model sample. Chow statistics were estimated to test a joint null hypothesis that the model was structurally stable in the two periods[9].

The consumption function testing gave the following outcome. V_1 = 2.18501, degrees of freedom (20,34), Pr[0.0217] and C_1 = 21.8, dof(4,54), Pr[0.0000]. The first rejects the null hypothesis of equal variances and the second rejects the hypotesis of stability. Both hypotesis being rejected does not provide ground to consider that the structural coefficients are significantly different and the test remains inconclusive(Cuthbertson et al.). To go deeper into the modification in the aggregate consumer behaviour, the model was computed on the basis of 1980[3]-1989[4] data and it was used to forecast quarterly consumption in the following years. The Hendry forecast CHI^2 test was applied as an indicator of numerical paramenter constancy. During 1990 and the first three quarters of 1991, the test accepted the null hypotesis of parameter constancy. In the fourth quarter of 1991, the test rejects the null hypothesis ($CHI^2(8)/8$ = 3.172 while the $F(8, \infty)$ critical value is 1.94 at the 5% level of significance.
This result shows that consumption behaviour seemed to change definitely after six months of economic program based on the convertibility of the peso. The change in the behaviour can be depicted by a considerable increase in the average propensity to consume. Given the present specification for the consumption function, marginal propensities give place to higher average

propensities in the modern consumer behaviour for Argentina. For instance, two consumption function estimated by IV/2SLS for different samples give the following results:

(i) $C_t = 0.65328\ Y_t + 0.15549\ Y_{t-1} + 0.075734\ \Delta(M3/p)_t - 25.765$ for 1980(3) to 1989(4)

(ii) $C_t = 0.5897\ Y_t + 0.17552\ Y_{t-1} + 0.017512\ \Delta(M3/p)_t + 81.331$ for 1980(3) to 1988(4)

The first estimate include the period of hyperinflation. If these functions are compared with eq. (1), it can be noticed that the sum of the marginal propensities to consume with respect to income are smaller than that estimated by the model. In the same fashion, the coefficient of $\Delta(M3/p)_t$ was smaller in the past. In other words the new consumer behaviour became more sensitive to sudden change in real balances and in general the average propensity to save declined. The latter shows that consumption increased relatively to income. Perhaps there appeared increases in the expenditures in durable goods because of better financing conditions, and second, the forced saving produced by the extremely regulated economy and public sector activities imposed restrictions on consumers. Inflation and indexing possibilities siphoned funds to buy bonds rather than consumption goods.

This relative expansion in consumption implied a reduction in the saving capacity and contrasted with the consumptive behaviour that prevailed in the inflationary experience of the past. These differences must be understood on the basis of a comparative framework and must not be considered as an element of choice between different specifications of the consumption function. In this analysis, given a particular specification of the consumption function, changes are considered based on differences in the value of the coefficients.

The test on the investment function shows the following: V_1 = 0.409779, dof(21,35), Pr[0.9831] accepting the null hypotesis and C_1 = 12.794, dof(3,56), Pr[0.0000] rejecting the hypotesis of structural stability. Changes in the investment behaviour are very important since 1990. The impact of past consumption has become stronger. The ratio I/Y ended its declining trend at eh end of 1989. Since then it grew to level around 0.20.

For the import function the results are similar. V_1 = 1.65173, dof(21,35), Pr[0.0923] accepting equality of variances at the 5% level of significance, and C_1 = 33.998, dof(3,56), Pr[0.0000] rejecting the stability of parameters. This is much clearer for the opening of the economy.

The tests on the money market function permit to accept the hypotesis of equality of variances but strongly rejects parameter stability. V_1 = 0.153009, dof(20,34), Pr[0.9999] and C_1 = 5.39, dof(4,54), Pr[0.0000].

According to these tests the economic behaviour of aggregates underwent modifications in the period of economic stability, deregulation, and state reform that took place with the new directions adopted by the Argentine Government in the mid-1989. Consumer behaviour seemed to adapt itself more gradually than the rest.

Next, the model was also used to measure the reactions of consumption generated by quarterly changes in the explanatory variables. Current endogenous variables are fitted by the model while lagged endogenous variables reflect actual values. In other words, the model was supposed to show the impacts in each quarter.

In tables V and VI, the quarterly changes in cousumption, investment and imports, are classified according to the source of variation.

The variation in the endogenous variables refer to the previous quarter. If knowledge about annual change is required, then variations between a particular quarter in two years must be added up. The result is the annual variation for the given quarter.

The evolution of consumption, shown in table V, presents the changes in consumption according to the respective incremental source of variation. Similarly, table VI, present changes in investment as consequence of changes in the real rate of interest and from domestic demand represented by consumer expenditures in the previous quarter. Imports discriminates its variation from current output and terms of trade changes.

Tables V and VI, include a column for each endogenous variables with the annual level of the variable, measured both in actual and estimated values. This is to have an idea of general evolution.

In 1990, in the first quarter consumption fell mainly by the contraction in the quantity of money in real terms. In December 1989, the authorities forced conversion of most of domestic commercial bank deposits (US$ 3.5 billion), and the bulk of Central Bank and Treasury's outstanding debt financed by deposits, into10-year dollar denominated external bonds (BONEX). This measure eliminated the Central Bank's short-term debt and interest burden on the quasi-fiscal deficit of the Central Bank.

However, in February 1990 hyperinflationary pressures reappeared due to unsolved fiscal deficit. The monetary effect was aggravated by a reduction in output. The rise in the real rate of interst reduced investment almost compensating the push from the previous quarter consumption.

In the second quarter, new measures were taken to go out of hyperinflation. Among them, the Central Bank was prohibited to finance directly or indirectly to the public sector and public enterprises.

In the third and fourth quarters consumption rose influenced mainly by current income. Nonetheless, in the end of the year, inflationary pressures reappeared, and this started reintroducing sudden negative monetary effects on consumption. Interest rates did not contract investment, because of the impact of the decline of inflation in the fourth quarter on the expectations and the effect carried over by the interest rate from previous quarter. The full impact of inflationary pressures came in the first quarter of 1991. Then, interest rates rose and affected investment.

Table V

Estimated Quarterly Changes in Consumption and their Source of Variation (thousands of 1986 pesos)

Period	**Consumption**. Source of variation				Annual Consumption **A** = Actual **E** = Fitted
	ΔY_t	ΔY_{t-1}	$\Delta\Delta M3/p$	ΔTotal	

I 1990	-98.03	25.39	-201.25	-273.90	A = 7346.6 E = 7432.1
II	113.61	-65.81	121.60	169.40	
III	53.90	48.63	2.13	104.66	
IV	40.76	19.99	-1.95	58.80	
I 1991	6.05	13.80	-12.92	6.93	A = 8398.8 E = 8384.9
II	-8,73	-47.49	9.52	-46.71	
III	152.98	78.07	2.73	233.78	
IV	-0.90	6.26	5.61	10.97	
I 1992	55.01	14.53	1.07	70.61	A = 9518.8 E = 9451.7
II	-1.66	-30.59	-0.73	-32.97	
III	156.98	79.57	3.04	239.59	
IV	-36.93	-11.04	-10.33	-58.30	
I 1993	-39.58	-10.27	13.95	-35.90	A = 10061.6 E = 9833.8
II	-36.48	-32.14	-12.87	-81.50	
III	148.14	78.50	8.87	235.51	
IV	26.59	7.34	-6.84	27.09	
I 1994	-6.04	-2.21	11.89	3.64	A = 10753.9 E = 10597.5
II	4.08	-19.34	-27.79	-43.06	
III	135.91	72.85	8.75	217.51	
IV	-6.54	-5.24	-4.41	-16.21	
I 1995	-54.80	-5.58	-28.75	-89.13	A = 10093.0 E = 10473.1
II	17.53	-45.22	12.76	-14.93	
III	-30.19	19.87	22.57	12.26	
IV	-40.49	-24.78	-7.47	-72.74	

The economic team was changed and in February. Cavallo, the new Minister started the implementation of a new fiscal package, opened the economy by lowering the maximum tariff to 22% and fixed the exchange rate. In the second quarter of 1991, the Convertibiliy Law established a mechanism by which money could be created only to purchase foreign exchange. Since then, stability was consolidated and the process of expansion in consumption was clearly established.

The fourth quarter of 1994 and the first quarter of 1995 show the reaction for the "tequila effect" in connection with the Mexican crisis. Hot-money outflows and a banking crisis

produced a severe recession in Argentina by affecting seriously the consumption in 1995. However, the change in the trend of monetary changes showed the gradual recovery of funds. The banking crisis was solved within the boundaries of the convertibility system by the reallocation of banking cash reserves and external funds. Consumption reacts positively to increases in the real quantity of money, while the general recession conditions prevail due to reduced output and income. Actual recovery was postponed until 1996.

It must be borne in mind that these changes intend to show the deterministic movements in consumption behaviour. Actual data include also the random components most of which receive influences from credibility and expectations from the market. Therefore, the random component implied an even more depressed level than those estimated particularly in 1995. Figure 1 presents actual and fitted values of consumption.

During 1995, some internal conflicts reappeared inside the Government which expressed themselves in a struggle between two leading forces: one of them tried to go deeper in the lines of the economic program mainly in its structural aspects and another line trying to divert from it in certain aspects like the course of new privatizations, patents regulations, and so on.

Table VI

Estimated Quarterly Changes in Investment and Imports and their Source of Variation (thousands of 1986 pesos)

Period	**Investment**. Source of variation			Annual Investment	**Imports**.Source of variation			Annual Import
	Δr_t	ΔC_{t-1}	ΔTotal		ΔY_t	Δtot_t	ΔTotal	
I 1990	-50.8	58.5	7.7	A = 1232.2 E = 1153.9	-60.9	-4.4	-65.3	A = 547.0 E = 625.59
II	121.0	-173.4	-52.4		70.6	131.8	202.3	
III	-43.6	175.6	132.0		33.5	-29.8	3.6	
IV	23.2	-14.9	8.3		25.3	-15.0	10.3	
I 1991	-13.4	11.1	-2.2	A = 1620.8 E = 1664.2	3.8	-28.5	-24.7	A = 960.4 E = 1018.0
II	12.0	-117.9	-106.0		-5.4	-0.7	-6.2	
III	-1.1	161.3	160.2		95.0	108.3	203.3	
IV	9.4	-71.1	-61.7		-0.6	-104.6	-105.2	
I 1992	-1.1	32.8	31.7	A = 2164.1 E = 2293.7	34.2	30.1	64.3	A = 1598.7 E = 1508.8
II	-1.0	-92.6	-93.6		-1.0	-29.7	-30.7	
III	-3.1	140.5	137.4		97,5	103.5	201.0	
IV	-0.4	-105.6	-106.1		-22.9	-126.1	-149.0	
I 1993	6.9	-32.1	-25.2	A = 2510.5 E =	-24.6	13.9	-10.7	A = 1813.3 E =
II	-5.1	-14.4	-19.5		-22.6	-13.4	-36.0	

III	-1.0	150.9	149.8	2515.8	92.0	117.5	209.6	1739.4
IV	-1.6	-66.8	-68.4		16.5	-78.6	-62.1	
I 1994	4.3	-59.2	-54.9	A = 3056.9 E = 2862.8	-3.8	-20.6	-24.5	A = 2221.4 E = 2110.2
II	-8.5	7.4	-1.0		2.5	8.9	11.4	
III	-1.8	94.7	92.9		84.4	80.5	164.9	
IV	-1.3	-83.1	-84.4		-4.1	-89.1	-93.2	
I 1995	-6.0	-31.0	-37.0	A = 2559.9 E = 2654.4	-34.0	-29.2	-63.3	A = 1964.5 E = 2103.6
II	4.6	-42.5	-37.9		10.9	44.9	55.8	
III	6.0	55.7	61.7		-18.7	-29.9	-48.6	
IV	-0.9	23.8	22.9		-25.1	-7.2	-32.3	

These factors introduced new constraints to the functioning of the economy. In fact, they expressed themselves in a slow recovery.

Concluding Remarks

The model estimated was used as a device to depict some changes produced in the behaviour of the Argentine economy in the period 1990-1995.

The economic system functions more easily with the new economic program, and an important process of reallocation of resources is taking place simultaneously. Economic agents substitute more efficient activities for those which are not. The state reform, implies the search for minimum cost solutions and this exerts less pressure upon consumption and investment decisions.

Some distinctive features happen in the money market. The rate of interest appears as determined by the incremental flows of funds in each quarter. Money is created by purchases of foreign currency by the central bank. At first sight, only changes in the quantity of money are determining the ruling real interest rate. But the fact, is that the market is composed of holders and non holders of new funds. Demand from holders (reservation demand)adds to demand from non holders and total demand equates total supply in each quarter. This behaviour which resembles the functioning of the stock market is characteristic of the period under analysis. The Central bank is a conversion board and provides domestic currency to foreign exchange suppliers. As a consequence the small trade of incremental funds clears the market in each quarter. The distinctive element is that this behaviour does not produce changes in real variables in the long term. Further expansion of the quantity of money reduces the rate of interest but expand transitorily demand for goods and services. Next quarter if the total money supply remains constant the previous effects are reversed and the impact on real variables disappear. This sort of behaviour will not last for ever, since it must be a feature of the transition to a more stable economy, though it is very difficult to foresee the end of the transition.

In short, the model reflects only short-run monetary effects on macroeconomic variables. This can be considered as an obvious result of the convertibility system which operates through the money supply. However, the model shows that the demand for money also behaves accordingly in the way above mentioned.

The model receives most of the impacts from the external sector. The quantity of money is affected by the net movements of foreign exchange reserves. Exports are exogenously determined and had maintained a rising trend during the period under analysis.

Consumption has relatively increased with respect to income. The average propensity to save has declined but it reflects a reaction for going out from the burden of inflationary conditions and a public sector endless greed to absorb and redirect funds. In the medium term this implies that external savings will be required. As long as the confidence in the economy grows - both domestic and foreign - the attitude to save will be reinforced.

The examination of the model components permit to state that the more unstable functions with respect to the long run are the consumption function and that reflecting the behaviour of the money market.

However, the pegged exchange rate and the convertibility system seem to be relevant instruments to guarantee sanity in the money functioning. In the past the Argentine economy became dangerously keen to excess regulation and to create rent seeking activities. The possibility that nobody cannot turn the credit mechanism in his own favour guarantees the transparency of the mechanism. In this period of transition, the absence of monetary effects in the real variables in the long term seems to be helpful to the prevailing economic program. Rigidity was matched by transparency in monetary policy.

For methodological reasons supply constraints and employment consequences have been left to be handled outside the present model. There are too many structural adjustments which may weaken the attempt to establish a particular relationship between either output and prices or output and employment. For the moment these problems had to be dealt from outside the model. As a hypotesis of study, the problem of outsider-insider might be highly relevant for Argentina.

From the study follows that impact multipliers are substantially smaller than long run multipliers. This situation was present in this model and in other computed by the author more than a decade ago. It could possibly reflect that the lag structure in the behaviour of the variables can be responsible to maintain changes for long. This warns of the danger of stimulating demand when supply rigidities are near. Inasmuch, they could reintroduce inflationary pressures. On this subject, the author believes that a more normal behaviour of the economy should bear greater impacts in the current period and rapidly converging future effects. Until this situation happens the chances of demand overflow do not disappear.

The existence of strong long-run impacts from demand increases does not necessarily mean success in an expansive fiscal policy. It must be taken into account the degree of responsiveness of supply. Here, crowding-out effects should be brought into action. It is clear that in this stage of transition the external sector is the relevant one if one expects permanent growth of the economy.
As a final remark, the analysis permit to follow the critical experience of the "Tequila Effect"in Argentina and how it was solved. It was easier than what the program's opposers believed. It

seems that the domestic tug of war between defenders and opposers of the economic program derived in the attempt of the latter to show the alleged fragility of the system. However, the economic measures in safeguard of the banking system and the external assistance were enough to keep the whole policy setup intact, and this was the initial step towards economic recovery. It was the strength of the transparency given by the convertibility system what permitted to overcome the crisis.

Notes

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1. The estimation was performed by the method of instrumental variables (IV/2SLS) which provides better estimates of the variance of the equation and of the covariance matrix of the parameters than the usual two-step procedure.See Keith Cuthbertson, Stephen G. Hall, and Mark P. Taylor (1992).
2. Ministerio de Economía. República Argentina. "Informe Económico No. 20. Año 1996.". The series of real exchange rate is elaborated by taking April 1991 = 1.
3. That behaviour is similar to the case of markets with fixed supplies, where the price system's role is to put the fixed supplies into the hands of the agents who wish them most (Stigler, 1952). In this case money appears as a result of exchanging foreign currency for domestic currency, and money changes place with commodities, until it is demanded as a money balance by someone else.
4. The long-run consumption function computed is the following: $C_t = 0.86498\ Y_t - 105.05$
(0.370720) (105.57)
The intercept can be neglected and the residual autocorrelation disappears. The LM test $CHI^2(2)/2 = 1.67$.
5. The root-mean-square error (RMS) is computed as follows:
$RMS = \{\mathbf{S}\ T^{-1}(Z_a - Z_e)^2\}^{0.5}$. The RMS error measures the deviation of the simulated variable from the actual time path. The RMS per cent error = $\{\mathbf{S}\ T^{-1}[(Z_a - Z_e)/Z_a]^2\}^{0.5}$. (Pindyck R.S. and Rubinfeld, D.L.(1976)). However this indicator is not suitable for the variable r_t because it oscillates very closely around zero. A better indicator for that variable could be (RMS/Zmean).
6. This vector includes a unit element corresponding to the constant in the reduced form.
7. In another model computed by the author in 1983 for the period 1950-1980, where variables only corresponded to the goods and services market with different specifications of functions, the X multipliers were: 2.21 (impact) and 11.30 (long run total effect)(Baccino, 1984). The long-run effects maintain more or less analogous proportionality with respect to short-run impact. This depends on the lagged influences in the structural equations. Demand expansion through time seem to be easy and it may be a result of long experience of inflation. Perhaps in so far as the economic agents become famiiar with the economy functioning in stability, impact effects might become larger and postponed effects smaller. If this is true, this multipliers show influences of unstable price system on real variables.
8. In that case the reduced-form coefficients excluded before will add a new dimension to the matrix $\mathbf{P_X}$, giving place for ΔM3/p long run impacts on the endogenous variables.
9. The test uses the statistic (Chow) C_1 that is distributed as F(k, T - 2k) to test H_0^1: $B_1 = B_2$ and V_1 that is distributed as $F(T_2 - k, T_1 - k)$ to test H_0^2: $\mathbf{s}_1^2 = \mathbf{s}_2^2$. The B's are the set of structural coefficients of the model in the corresponding sample, and the $\mathbf{s}^2$'s are the error variances. $C_1 = \{[RSS_T-(RSS_1-RSS_2)]/(RSS_1+RSS_2)\}[(T-2k)/k]$. $V_1 = (RSS_2/RSS_1)(T_1-k)/(T_2-k)$. See Cuthbertson et al. .

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Appendix A

Data Sources and Actual Values of Aggregates

The data used in constructing the model covers the period 1980[1]-1995[4]. After performing several tests, the period 1990[1]-1995[4] was chosen as a sample for the model estimation.

The national accounts aggregates are in real terms, in thousands pesos of 1986. Sources were: "Cuentas Nacionales. Oferta y Demanda Globales. 1980-1995". Ministerio de Economía de la República Argentina. September 1996.

The deflator used was the arithmetic mean of consumer and wholesale price indexes. (1986=100). National Board of Statistics of Argentina, published by "Techint. Boletín Informativo #286. April-June 1996."

The quarterly changes in the quantity of money were measured upon the basis of real M3 in domestic currency. The exclusion of foreign currency was made deliberately to keep the same composition fron 1980 to 1995. M3 in domestic currency depicts well the behaviour of the quantity of money. M3 was deflated monthly and later was aggregated for each quarter. The Central Bank of the Agentine Republic. (From Juan Carlos de Pablo's personal files).

The variable $qinf_t$ is obtained by differencing the log of the combined price index and represents the continuous rate of quarterly change of prices.

The real rate of interest was calculated by deflating the nominal monthly rate of interest paid by first-line-firms for loans by the combined monthly price index. FIDE from Central Bank data, from 1980-1985; and ECLA's office in Buens Aires from 1986 to 1995.

The index of terms of trade was built by linking data was obtained from Reports of ECLA office in Buenos Aires for 1980-1991, and from "Carta Económica" for 1993-1995. The data for 1992 has been estimated.

Actual Values of Enodogenous Variables and Exports. 1990-1995

Period	Observed Variables (thousands of 1986 pesos)					
	Y_t	C_t	I_t	X_t	M_t	r_t
I 1990	2063.4	1662.5	258.4	278.1	135.6	0.372615
II	2297.1	1790.4	304.8	313.5	111.7	-0.09516
III	2393.2	1886.9	323.4	314.5	131.7	0.026112
IV	2459.5	2006.9	345.6	275.2	166.1	0.014584
I 1991	2231.2	1877.9	302.2	233.7	182.7	0.008656
II	2606.4	2089.3	406.1	308.1	197.0	-0.04142
III	2636.5	2150.6	434.0	316.6	264.7	0.001278
IV	2706.3	2281.1	478.6	262.7	316.1	0.008028
I 1992	2559.3	2216.3	439.7	245.8	342.5	-0.00014
II	2941.7	2447.9	561.1	307.1	374.4	-0.00044
III	2888.6	2456.7	575.5	307.7	451.3	0.002354
IV	2839.2	2397.9	587.8	284.0	430.5	0.015649
I 1993	2684.8	2308.7	502.7	265.3	391.9	0.002732
II	3062.0	2537.8	614.0	317.9	407.7	-0.00126
III	3097.3	2625.9	659.7	298.2	486.6	0.002424
IV	3086.7	2589.2	734.2	290.4	527.1	0.004428
I 1994	2993.7	2568.2	693.0	282.1	549.6	0.005381
II	3343.8	2746.9	771.9	362.1	537.1	0.004051
III	3318.7	2750.4	777.6	355.9	565.3	-0.00012
IV	3291.7	2688.4	814.5	358.2	569.4	0.004625
I 1995	3074.4	2536.9	700.8	371.7	534.9	0.012778
II	3169.9	2502.8	635.9	488.6	457.3	0.003461
III	3050.8	2518.9	588.7	413.9	470.7	0.0047
IV	3060.2	2534.5	634.6	392.8	501.7	0.004513

Appendix B

Unit-root tests for integration of the variables

Dickey-Fuller, Durbin-Watson and Augmented Dickey-Fuller Statistics

ariables Z	DF	DW(z)	ADF k=1	ADF k=2
Y_t	0.8348	0.3185	1.094	1.136
ΔY_t	-7.253**	2.686	-4.099**	-4.405**
C_t	1.287	0.1668	1.201	1.104
ΔC_t	-5.655**	2.221	-3.412	-3.145**
I_t	0.6919	0.1659	0.7195	0.3984
ΔI_t	-5.696**	2.281	-2.77**	-3.165**
X_t	0.2061	0.6128	0.2741	1.309
ΔX_t	-5.604**	2.391	-5.736**	-4.998**
M_t	1.27	0.07585	0.7181	0.9872
ΔM_t	-2.95**	1.342	-3.102**	-1.696
r_t	-41.29**	1.609	-3.706**	-4.112**
$\Delta[M3/p]_t$	-8.241**	1.071	-2.119**	-1.478
tot_t	0.5647	0.2327	0.6925	0.6972
Δtot_t	-4.984**	2.186	-3.982**	-2.845**
$qinf_t$	-16.63**	0.3378	-3.091**	-4.089**

** Significant at the 1% level.

Appendix C

Coefficients of the Model with Seasonality (M2)

$C_t = 0.65633\ Y_t + 0.1948\ Y_{t-1} + 0.2555\ [M3/p]_t - 63.833$
(0.0619) (0.05780 (0.0864) (85.183)

$I_t = -37.443\ r_t + 0.49847\ C_{t-1} - 70.96\ S1 + 49.87\ S2 - 16.704\ S3 - 595.91$
(118.08) (0.0263) (23.42) (23.46) (22.430 (65.24)

$M_t = 0.4783\ Y_t - 0.55\ tot_t + 80.097\ S1 - 73.12\ S2 - 18.10\ S3 - 911.01$

rt=8.2e-005 Yt - 0.478rt-1 - 0.0001[M3/p]t+ 0.274qinft + 0.01S1 -0.03S2 -0.02S3 - 0.235
(3.5e-005) (0.11) (0.0001) 0.069) (0.017) (0.016) (o0.016) (0.11)

For each equation the CHI2 tests for **b** = 0 are highly significant. The Si's are seasonal variables.