Endogenous foreign capital flow in Brazil: The role of the Foreign Reserves

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Abstract:

In this paper we model the foreign capital flow in Brazil as an investment decision which depends on the expected rate of the international reserves lose of the country. The theoretical justification for that assumption is that the foreign investor takes the foreign reserves level as a collateral for their lending and private investments. An interesting empirical fact is that the shape of the curve relating these two macroeconomic variables is well behaved in periods without significant international crises, whereas in other periods that behaviour is not observed. The relationship between these two variables allows to observe the difference between the expected and the observed value of the foreign reserves lose (non-perfect prevision). Finally we use that relationship to re-calibrate the Computable General Equilibrium (CGE) model with base-year 1998. Since in that year there were two significant crises the re-calibration is necessary to evaluate the real impacts of the FTAA and the EU trade agreements.

JEL Classification: C68, F11, F17

Keywords: Foreign Capital Flow, Free Trade Agreements, Computable General Equilibrium

1. Introduction

One of the macroeconomic variables that researchers must consider in the impact evaluation of international trade agreements is the foreign capital flow (*FCAP*). Long and short run investments and lending impact the exchange rate (and so the imports and exports) and the capital accumulation in production sectors. In a most integrated financial world, where the barriers to foreign capital are less restrictive and the transaction costs are low, the *FCAP* may be a trigger for the development of the country or may difficult the growth targets proposed by the policy makers.

It arises the following question: In an economy where the barriers and transaction costs to the foreign capital are reduced, what are the determinants of the *FCAP*? As any aggregate macroeconomic variable, there are many parameters and variables than can affect each component of *FCAP*. For example, the (average) borrowing rate of interest, the rate of return of capital, the solvency of the country among others. Some of these parameters and variables are known in advance (as pre-fixed rate of interest) and others are only revealed at the end of the period of investment. For the later, investors have to formulate some *priors* for the end-of-period variable value and (depending on their skills and objectives) they may look at the expected value or other (statistical) moments of these variables.

In this paper we propose that the foreign capital flow depends on the expected value of the rate of the loss of foreign reserves. The theoretical foundation for this hypothesis is that the foreign reserves are taken, as collateral by foreign investors and its level at the end of the period is the relevant variable for the investment decision of international financial agents.

In the literature we can find other alternatives to model the supply of foreign capital. Khan and Zahler (1989) proposed that the capital inflow depends on the spread of interest rate, the risk of the country and the devaluation of the currency in the relevant period. Azis (2000) considered that the outflow of foreign capital depends on the expected exchange rate for the next period in order to explain the transition from financial crises to social crises in Indonesia's economy.

Specifically, in this paper we describe the evolution of these two macroeconomic variables: The foreign capital flow (*FCAP*) and the rate of the foreign reserves lose (*RLSFRES*). It is showed that these variables follow a well-defined behavior pattern in periods without significant international crisis; however, in periods with a significant crisis the pair (*RLSFRES*, *FCAP*) stays away from that pattern. This singular fact allows us to suppose that *FCAP* in fact depends on the

expected value of the rate of loss of foreign reserves ($RLSFRES^e$) and in absence of crisis this expected rate coincides with the observed rate (self-fulfilled expectations).

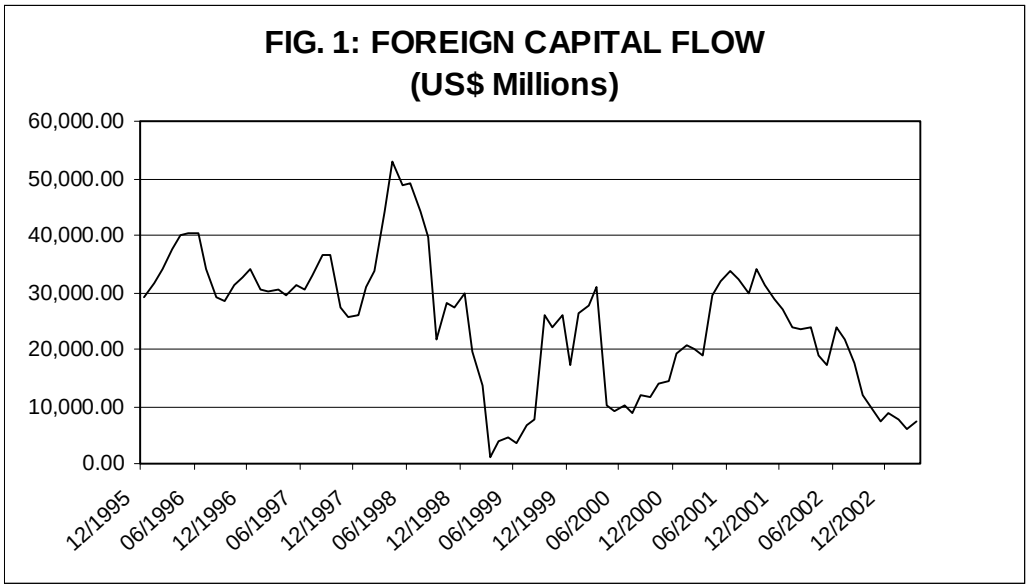
With an explicit form for the relationship between *FCAP* and $RLSFRES^e$ it is possible to find the expectations of the loss of foreign reserves in a period with crises and construct a hypothetical scenario without crises in order to measure the impacts of the crises in all the other variables. In particular, we use a Computable General Equilibrium model to embody that relationship between *FCAP* and $RLSFRES^e$ in order to calibrate the model in a non crisis scenario. Finally, in order to capture some dynamic effects, it is introduced a long run relationship between capital and investment which allow us to evaluate the aggregate and sectorial effects of international trade agreements in Brazil.

The paper is divided in four sections. In section 2 it is made a description of the time series $(FCAP_t, RLFRES_t)$ from December 1995 to March 2003 and the hypothesis of their dependence is stated. In section 3 the impacts of the 1998 crises in Brazil (Russian and devaluation crises) are analyzed in aggregate and sectorial economic variables. We also measure in that section the impacts of the international trade agreements (FTAA and EU). Finally, in section 4 we make some final comments. In appendix A1 we describe the estimation of the functional form for the relationship between *FCAP* and $RLSFRES^e$. In appendix A2 the effects of the trade agreements in a scenario with crises are reported. The list of equations in the CGE model is given in appendix A3.

2. The influence of the rate of loss of foreign reserves on the foreign capital flow

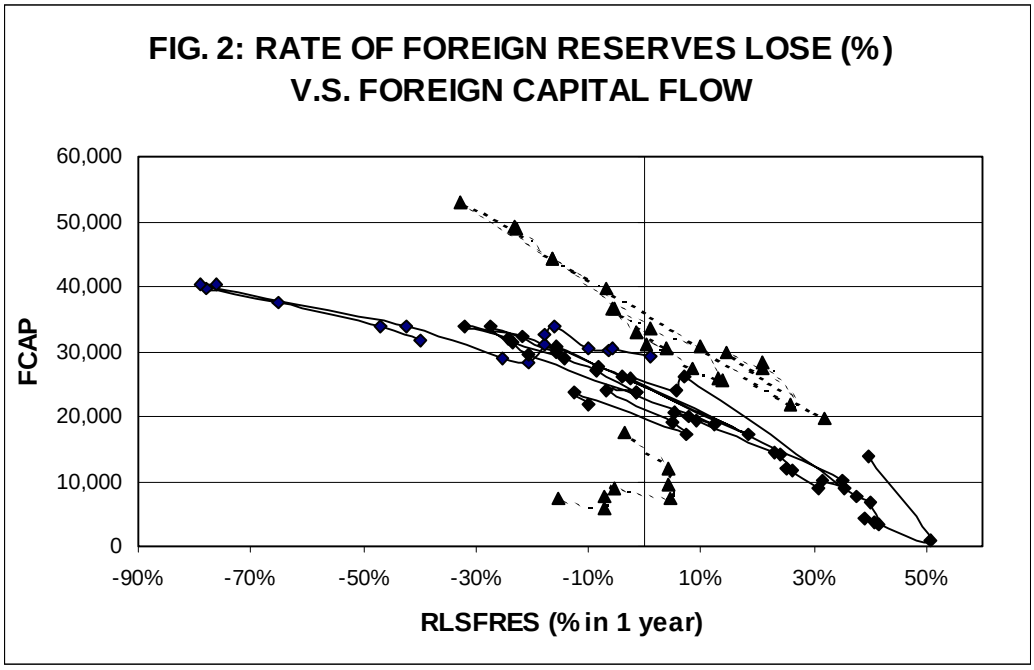
In the last decade the foreign capital flow in Brazil experimented significant fluctuations even in periods when the international rules of trade and the interest rate policies remain unchanged. Regressions relating foreign capital flow with other macro variables (domestic and foreign interest rates, exchange rates, and risk of the country) have not been so successful. Figure 1 shows the foreign capital flow (*FCAP*) in Brazil from December 1995 to March 2003.

Observe that even in the "Plano Real" period, where the rules and policies related to international capital have a clear stability there were significant changes in the foreign capital flow. That could be explained as a risk adverse behaviour of foreign investors when it is perceived a possible deterioration of the financial system resulting from an international crisis.



Foreign investor can take many parameters or variables to decide the capital supply in the country. CGE models considered variables as interest rates spreads, devaluation, political and country risk. (Azis (2000) used these specifications to explain the transmission of the Asiatic financial crises to the Indonesia social crises).

In this work we consider that the foreign capital flow depends on a variable that (in some sense) aggregates all the variables above*: The expectations of loss of foreign reserves*. The reasoning is quite simple, for a given range of foreign reserves, if the foreign investor expects an increasing in foreign reserves then he will invest in the country since the payments of the returns are guaranteed. On the other hand, if the prevision he has is a loss of foreign reserves then he will not invest (or even a capital outflow will be observed) in the country. Figure 2 shows the evolution of these two variables, the foreign capital flow *FCAP* (US$ Millions) and the rate of loss of foreign reserves (the foreign reserves lose divided by the foreign reserves level at the beginning of the period) *RLSFRES* in Brazil. The considered period is from December 1995 to March 2003. Each point shows the foreign capital flow and the rate of international reserves lose in the last 12 months, in this way we can follow the monthly evolution of these two variables.



An interesting fact is that in periods without significant crises (January 1996 to April 1997 and February 1999 to July 2002) it is following a well defined pattern. We jointed all these months, marked with a "♦", with a continuous line. All the other months, marked with "▲" were jointed with a discontinuous line. The months marked with "▲" include the Asiatic and Russian crises as well as the currency devaluation and the uncertainty related with the elected government at the end of 2003.

For that reason it will be supposed that the investment decision of foreign agents depend on the expected end-of-period rate of the loss of foreign reserves. The theoretical foundation for that assumption is that the foreign investors take the expected level of foreign reserves constituted by the country as collateral in order to decide their lending and investments. From that hypothesis we can write:

$$FCAP = f(RLSFRES^e),$$

where $RLSFRES^e$ is the expected rate of the loss of foreign reserves, i.e. if $FRES$ is the initial level of foreign reserves and $LSFRES^e$ is the expectation of international reserves lose then $RLSFRES^e = (LSFRES^e / FRES)$. It will be supposed that f is a strictly decreasing function which is compatible with a risk adverse behaviour. Now we will analyse the implications of that assumption in a partial equilibrium model and then in a CGE model.

The adjustment of f is made in appendix A1. Firstly, let us discuss the implications that the relationship above has in a partial equilibrium setting. To do this let us fix the level of foreign

reserves at the beginning of the period (*FRES*) and the foreign saving (*FSAV*). Then the equilibrium equation in the Current Account Balance can be written:

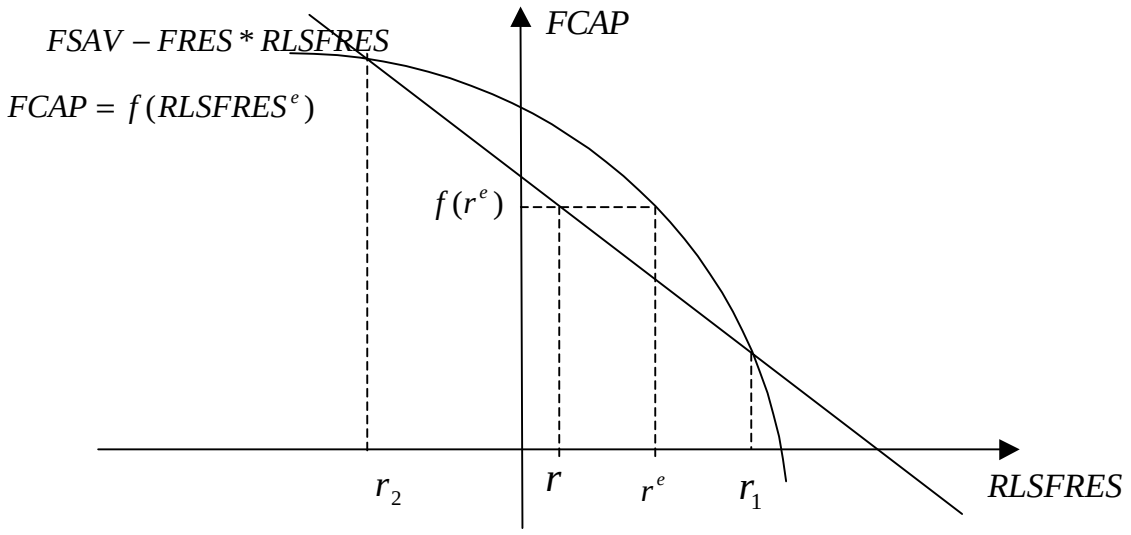
$$FSAV = FCAP + LSFRES\ ,$$

LSFRES represents the loss of foreign reserves in the period. With the specification given for the foreign capital flow it results:

$$FSAV - FRES * RLSFRES = f(RLSFRES^e)\ .$$

Equation above must be read in the following way: Given the expectation of international reserves lose $RLSFRES^e$, the investment decision of the foreign investor is given by $FCAP = f(RLSFRES^e)$; thus it will determine the actual value for the loss of foreign reserves from the equation $RLSFRES = (FSAV - f(RLSFRES^e))/FRES$. If $RLSFRES = RLSFRES^e$ we will say that the expectations were self-fulfilled, otherwise it will be a temporary equilibrium. To understand the difference between these two equilibria figure 3 shows the current account balance equilibrium line ($FCAP = FSAV - FRES * RLSFRES$) and a possible shape for the *FCAP-RLSFRES* curve ($FCAP = f(RLSFRES^e)$).

FIG. 3: Self-fulfilled and temporary equilibria for the rate of loss of foreign reserves



It is easy to see that if the expectations of the loss of foreign reserves is r_1 or r_2 then the capital supply will coincide with the correspondent in the current account balance and then the expectation of the loss of foreign reserves is self-fulfilled obtaining as equilibria $(r_1, f(r_1))$ and

$(r_2, f(r_2))$ respectively. Otherwise if the expectation of the loss of foreign reserves is r^e then the foreign capital supply is $FCAP = f(r^e)$ and it will produce and actual international reserves lose given by r. In this case we will say that $(r, f(r^e))$ is a temporary equilibrium.

Such not self-fulfilled equilibria may occur because of unexpected adjustments in the current account balance (for example in a crisis). So firstly we will analyse if in 1998 the Brazilian economy was in a self-fulfilled equilibrium or it was just a temporary equilibrium. By the previous discussion it is expected that the equilibrium in that year was not self-fulfilled because of the Russian crisis and currency devaluation. Once it is made, we can simulate the equilibrium in absence of the crisis (i.e. we will suppose that the actual rate of the loss of foreign reserves is equal to the expected rate), this exercise will allow us to evaluate the effect of these crises in the Brazilian economy.

Before finishing this section, let us analyse the stability of the self-fulfilled equilibria. If an error in prevision of the rate of loss of foreign reserves is made from the self-fulfilled equilibrium r_1 then the actual rate will move away from the self-fulfilled equilibrium. On the contrary, a deviation from the self-fulfilled equilibrium r_2 will made that the actual rate remains closer to this self-fulfilled equilibrium. In this case we will say that r_2 (r_1 respectively) is expectationally stable (unstable respectively)[1].

To analyse the expectational stability of a self-fulfilled equilibrium we use the derivative of *f*. So r_i is expectationally stable if $|f'(r_i)| < FRES$ and r_i is expectational unstable if $|f'(r_i)| > FRES$.

Finally we can use the adjustment of *f* given in the appendix A1 to observe the evolution of the Current Account Balance equilibrium line from 1995 to 2002. Table 1 shows the values of *RLSFRES* and *FCAP* for those years.

TABLE 1

DATE	1995	1996	1997	1998	1999	2000	2001	2002
%RLSFRES	-33.59%	-15.95%	13.20%	14.60%	18.44%	9.17%	-8.65%	-5.46%
FCAP	29095.4	33968	25800.3	29701.6	17319.2	19325.6	27052	8810.9

[1] See Evans e Honkapohja (1999) for the definition of expectational stability.

Fig. 4: Foreign Capital Supply X Current Account Balance Equilibrium (1995)

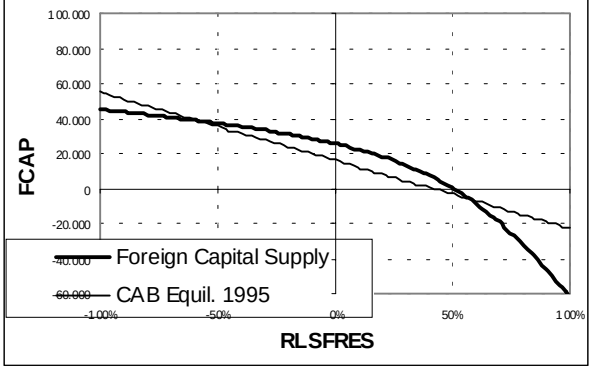


Fig. 5: Foreign Capital Supply X Current Account Balance Equilibrium (1996)

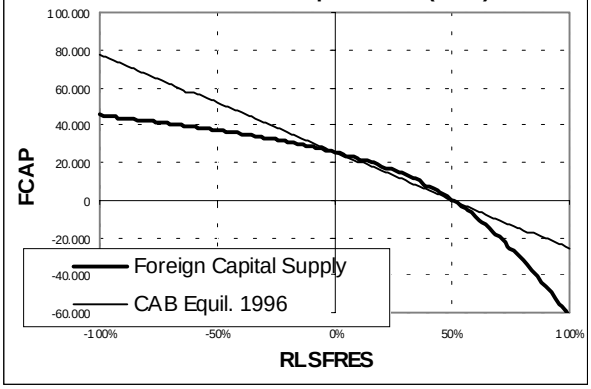


Fig. 6: Foreign Capital Supply X Current Account Balance Equilibrium (1997)

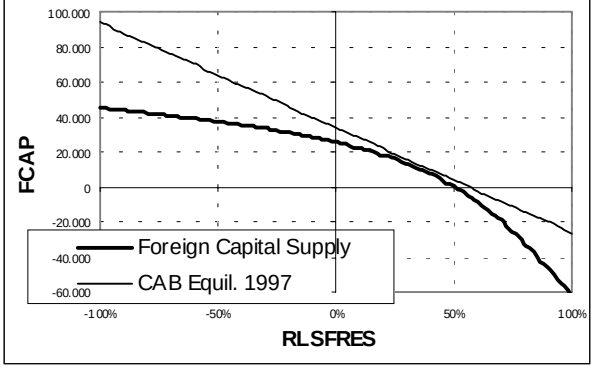


Fig. 7: Foreign Capital Supply X Current Account Balance Equilibrium (1998)

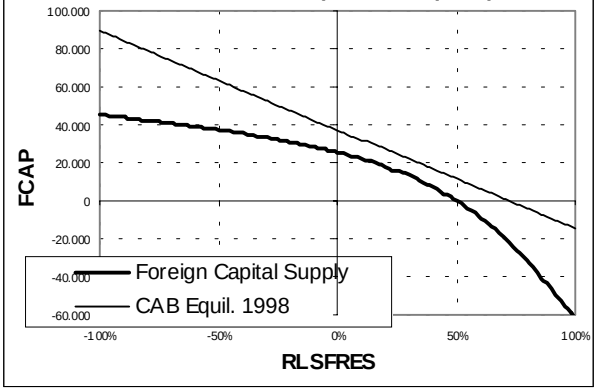


Fig. 8: Foreign Capital Supply X Current Account Balance Equilibrium (1999)

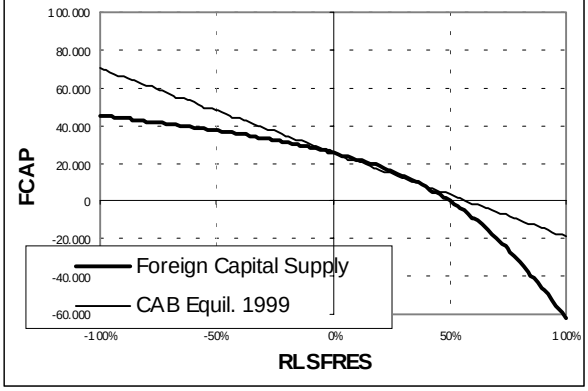
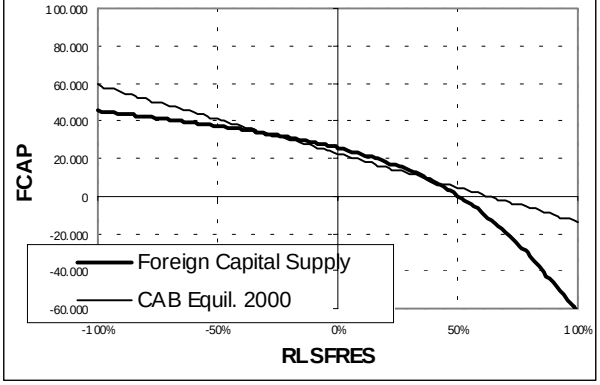
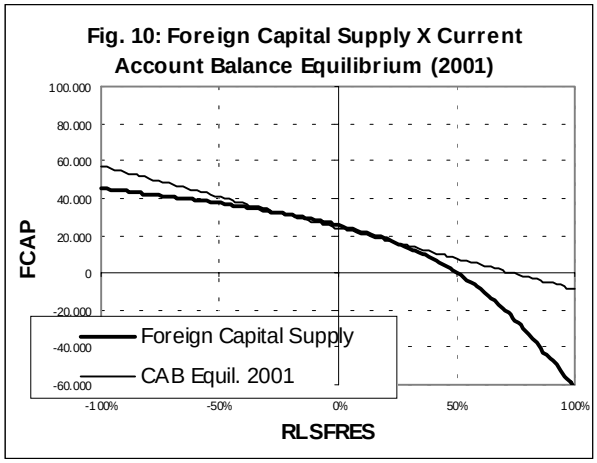
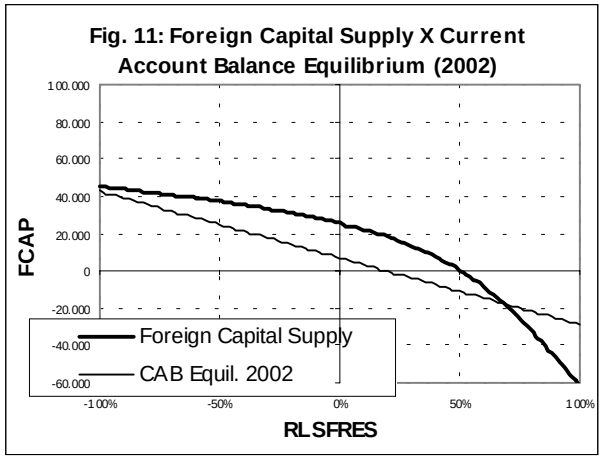


Fig. 9: Foreign Capital Supply X Current Account Balance Equilibrium (2000)







3. The impacts of the crises and the effects of trade agreements

In this section we are going to analyze if in 1998 (the year when Tourinho and Kume (2002) calibrated the CGE model) the equilibrium was self-fulfilled or not. If not, we will simulate the self-fulfilled equilibrium of the economy and then evaluate the impacts of the crises, which produced the difference between the self-fulfilled and the observed equilibria. After this we are going to evaluate the effects of the free trade agreements in the economy without crisis.

3.1. Self-fulfilled equilibrium in the base year

Using the adjusted functional form of f given in Appendix A1 we can calculate the expectation of the rate of foreign reserves lose in 1998. Substituting the foreign saving value of that year ($FSAV = 38{,}340$ US$ millions) and the actual foreign reserves lose ($LSFRES = 7{,}617$ US$ millions) in the Current Account Balance equation $FSAV - LSFRES = f(RLSFRES^e)$ we will obtain $LSFRES^e = -9{,}950$ US$ millions, so it was expected a foreign reserves increasing for that year. It means that the Russian crisis and the currency devaluation produced a foreign reserves lose of 17,567 US$ millions.

Finally we can conclude that in absence of that crises (i.e. if the expectations were self-fulfilled) the foreign saving flow would be $FRES * RLSFRES^e + f(RLSFRES^e) = 20{,}773$ US$ millions, lower than it was because of the international reserves accumulation.

With all this information about *LSFRES* and *FSAV* in a self-fulfilled behavior (and therefore, simulating absence of crises) we proceed to recalibrate the General Equilibrium Model for 1998. To this end we substitute the values of these variables into the non-linear equation system described in appendix A3 and using the GAMS package that system is solved. In table 2 we report the macroeconomic variable values of this equilibrium as well as the variations they have in a crises setting.

Table 2: Macroeconomic impacts of the 1998 crises

		EQUIL.	CRISES
	Units	Value	%
GDP	R$ millions	892,057	0.9%
Investment	R$ millions	168,661	13.5%
Private consumption	R$ millions	568,182	0.7%
Government expenditure	R$ millions	159,791	0.1%
Goods and services balance deficit	US$ millions	3,564	478.6%
Exports	US$ millions	65,501	-12.2%
Imports	US$ millions	69,065	13.1%
Services balance deficit	US$ millions	7,803	26.5%
Foreign saving	US$ millions	20,773	84.6%
Government deficit	R$ millions	70,520	-5.2%
Entrepreneurs saving	R$ millions	59,649	2.5%
Households saving	R$ millions	41,874	0.7%
Exchange rate	R$/US$	1,284	-9.4%
Consumer price index		1,068	-0.1%
		Value	Value
Trade balance deficit	US$ millions	-4,239	10,749
Foreign reserves lose	US$ millions	-9,950	7,617

The column “EQUIL.” corresponds to the macroeconomic variable values when the foreign saving is equal to 20,773 US$ millions (lower than its value in crises). Observe that it results because in a non crises environment there is an increasing in foreign reserves level (in 9,950 US$ millions). The column “CRISES” corresponds to the deviations from the equilibrium values of the same variables due to the crises in 1998. The trade balance in equilibrium reports a *superavit* whereas in crises it attains a deficit of 10,749 US$ millions. The investment increasing is explained by the loss of foreign reserves necessary to diminish the impacts of the crises. Such a loss was enough to guarantee a Private Consumption and a Gross Domestic Product levels almost invariant As most of the international crises the main impacts are in the trade balances and in the loss of foreign reserves.

Analogously we can compute the effects of the crises in the sectorial production, exports and imports. Table 3 shows these impacts in each sector. As in table 2, the column “EQUIL” states

the variable values for the economy when we replace the values of foreign savings and foreign reserves lose by FSAV = 20,773 and LSFRES = -9,950 (so, when the crises were purged).

Table 3: Sectorial Impacts of the 1998 crises

SECTOR	Gross Product		Imports		Exports	
	Equil	Crises (%)	Equil	Crises (%)	Equil	Crises (%)
Agriculture	113,695	-1.5%	2,133	21.0%	3,668	-6.2%
Minerals	7,797	-4.1%	324	4.0%	4,047	-6.1%
Petroleum, natural gas, coal and other fuels	6,059	-4.3%	2,674	3.7%	12	-8.3%
Non-metallic minerals	19,082	7.4%	513	17.3%	891	-6.3%
Iron and steel industry	25,486	-4.0%	898	1.0%	3,926	-13.1%
Non-ferrous metals	11,380	-4.5%	966	16.5%	1,863	-9.6%
Other metallic products	23,173	0.4%	1,389	15.3%	1,201	-12.9%
Machineries and tractors	27,024	-3.2%	6,451	22.4%	3,790	-15.2%
Electrical machinery and apparatus	14,831	3.6%	3,338	7.2%	1,529	-9.0%
Electronic equipement	11,686	4.9%	7,525	8.7%	1,199	-6.5%
Cars, trucks and buses	22,035	-6.8%	2,294	74.5%	4,019	-18.2%
Other vehicles and parts	21,387	-8.5%	5,357	0.9%	5,938	-19.8%
Wood and furniture	14,058	0.2%	276	37.7%	1,596	-10.2%
Paper products, publishing	24,324	-2.1%	1,265	4.7%	1,981	-10.3%
Rubber industry	7,564	-6.1%	770	8.2%	812	-17.1%
Chemical (non-petro-chemical) elements	15,842	-3.9%	1,906	11.4%	1,037	-15.9%
Refined petroleum and petro-chemical industry	56,218	-1.1%	5,332	1.6%	1,768	-12.0%
Other chemical products	21,064	-1.8%	2,353	4.5%	972	-13.3%
Pharmacy and perfume products	15,685	0.3%	2,508	6.3%	526	-11.8%
Plastic products	10,252	0.2%	692	12.0%	285	-11.2%
Textiles	18,109	-4.3%	1,466	15.8%	1,144	-15.4%
Wearing apparel	9,490	0.6%	255	18.8%	117	-11.1%
Footwear, leather products	6,795	-22.1%	302	0.0%	3,019	-31.2%
Coffee	10,534	-5.8%	2	50.0%	2,536	-9.8%
Tobacco	24,705	-2.0%	902	10.6%	3,245	-7.6%
Meat products	21,654	-1.1%	219	29.2%	1,515	-4.0%
Dairy products	9,837	0.1%	407	19.9%	21	-9.5%
Sugar	8,219	-10.9%	3	0.0%	2,407	-21.7%
Vegetable oils and fats	15,280	-3.9%	347	29.7%	2,831	-6.8%
Other food products and beverages	32,004	-0.7%	1,267	10.4%	1,187	-9.6%
Other industries	8,520	-4.0%	1,474	27.8%	768	-16.0%
Public utilities	39,658	-0.1%	942	1.9%	0	
Construction	121,784	13.5%	0	19.3%	0	
Trade	113,654	-0.3%	849	15.5%	648	-2.6%
Transportation	54,675	-0.3%	1,918	15.0%	444	-2.5%
Communication	26,083	0.1%	163	16.0%	201	-7.5%
Renting services	127,825	0.7%	5	20.0%	0	
Public administration and defense, education and	173,001	0.0%	1,038	2.0%	671	-4.9%
Other services	232,023	0.0%	8,540	16.6%	3,688	-2.5%
TOTAL	1,522,491	0.2%	69,065	13.1%	65,501	-12.2%

The more affected sectors in their production activities were “Other vehicles and parts” with –8.5%, “Footwear, leather products” with –22.1% and “Sugar” with –10.9%. Note that the same sectors are among the most affected in exports with variations of –19.8%, 31.2% and 21.7%. Other sectors with sensible decreasing in export were “Rubber industry” with –17.1% and “Other industries” with 16.0% . The information given in table 3 can be used as a criterion to evaluate policies of sectorial aid against international crises taking in account that this information is qualitative rather than quantitative.

3.2. Effects of free trade agreements

In this section we analyze the response of macroeconomic and sectorial variables in a CGE model to the international trade agreements FTAA, EU and a bilateral agreement ALCA&EU which are in discussion nowadays. To do this we execute a comparative static exercise varying the import taxes and export prices in such a way to simulate the trade agreement. Tourinho and Kume (2002) estimated the new import taxes and export prices variations, they are described in appendix A2.

In order to capture some dynamical features coming from international free trade agreements we introduce three new relationships. The foreign capital supply equation given in section 2 $FCAP = f(RLSFRES^e)$, the self-fulfilled expectation equation $LSFRES^e = LSFRES$ implying that we want to eliminate the effects of any international financial crisis and the long-run equation relating the total invest in the economy (*INVEST*) with the capital stock of the economy (*K*):

$$INVEST = (n + \delta)K ,$$

here *n* is the growth rate of labor and δ is the depreciation rate of capital. The intuition behind these equations is simple: From the foreign capital supply equation, lowering the expected lost of foreign reserves, the foreign capital flow will increase and so the foreign saving. It will allows to increase the investment in the economy which is going to be distributed in the capital stock trough equation above. Finally, the increasing in GDP will increase exports (probably more than imports) and this will self-fulfill the expectations of lowering the lost of foreign reserves. Actually, some of these effects are not clear in net terms, so a CGE will explain more precisely which effect will dominate in each variable. Table 4 describes the effects in macroeconomic variables. The column "EQUIL." shows the values of the macro variables in the simulated equilibrium (as described above). The other columns show the variation with respect to this equilibrium in each simulation of the free trade agreements.

There are at least two key elements that have to be noted before reading all this table. The first one is that in trade agreements FTAA and EU there is an increasing in foreign reserves, which allows a greater Foreign Saving. The second is a consequence of that, a decreasing in the Exchange Rate. The valorization of the local currency allows an increment in imports greater

than in exports diminishing the superavit in the Trade Balance. The same effect appears in the FTAA&EU agreement however amplified because in that case the Lost in Foreign Reserves has a greater effect in Foreign Saving and the valorization of the "Real" is greater than in the other agreements. What is particularly interesting is the effect in the GDP, the increment in local currency terms is amplified by the valorization that it experiments (the increment of the GDP in the FTAA&EU agreement is about 4.81% in dollar). This effect is quite expressive and it was not found in other simulations of the free trade agreements.

Table 4 - Macroeconomic impacts of the free trade agreements

		EQUIL.	FTAA	EU	FTAA&EU
	Units	Value	%	%	%
GDP	R$ millions	892,057	0.1%	0.2%	0.2%
Investment	R$ millions	168,661	0.2%	0.3%	0.4%
Private consumption	R$ millions	568,182	0.5%	0.6%	1.1%
Government expenditure	R$ millions	159,791	0.8%	0.9%	1.6%
Goods and services balance deficit	US$ millions	3,564	91.2%	90.4%	179.5%
Exports	US$ millions	65,501	0.1%	-0.5%	-0.3%
Imports	US$ millions	69,065	4.8%	4.2%	9.0%
Services balance deficit	US$ millions	7,803	9.7%	6.1%	14.7%
Foreign saving	US$ millions	20,773	16.3%	15.9%	31.8%
Government deficit	R$ millions	70,520	4.5%	4.9%	9.0%
Entrepreneurs saving	R$ millions	59,649	0.5%	0.7%	1.2%
Households saving	R$ millions	41,874	0.5%	0.6%	1.1%
Exchange rate	R$/US$	1.284	-3.0%	-1.6%	-4.4%
Composite price index		1.068	-0.2%	-0.1%	-0.3%
		Valor	Valor	Valor	Valor
Trade balance deficit	US$ millions	-4,239	-1,747	-1,496	1,013
Foreign reserves lose	US$ millions	-9,950	-3,068	-3,269	5,478

Finally, we report the results of the experiment in the sectorial variables. Table 5 shows the effects of the free trade agreements in Production (X), Imports (M) and Exports (E) in each sector we consider in our model. The columns X, M and E represent the values of the sectorial production, imports and exports in the "virtual" equilibrium (equilibrium in 1998 after eliminating the international crises effect). The other columns represent the rate of variation with respect to this equilibrium when the new tariffs and export price are included.

Sector with better responses to the international trade agreements (especially with respect to the FTAA&EU agreement) are: Sugar (increment of 16.19% in production and 30.2% in exports), Footwear, leather products (increasing 18.2% in production and 24.48% in exports) and Tobacco (increasing 6.42% in production and 18.24% in exports). The sectors with greater loses in that trade agreement are: Machineries and tractors (diminishing 7.52% in production and 12.88% in exports) and Other industries (decreasing 6.3% in production and 11.85% in exports). The Total effect of the FTAA&EU agreement in exports is just –0.25% in exports.

Table 5: Sectorial impacts of the free trade agreements

SECTORS	Gross Product (X)				Imports (M)				Exports (E)			
	X Equil.	FTAA %	EU %	FTAA&EU %	M Equil.	FTAA %	EU %	FTAA&EU %	E Equil.	FTAA %	EU %	FTAA&EU %
Agriculture	113,695	0.71	1.10	1.75	2,133	9.28	3.89	12.99	3,668	-0.87	4.44	3.57
Minerals	7,797	-2.72	-1.18	-3.63	324	0.31	0.00	0.00	4,047	-3.41	-1.41	-4.50
Petroleum, natural gas, coal and other fue	6,059	-1.53	-0.83	-2.24	2,674	1.65	0.64	2.21	12	0.00	0.00	0.00
Non-metallic minerals	19,082	0.27	-0.01	0.27	513	2.73	4.68	8.19	891	2.58	-2.47	0.45
Iron and steel industry	25,486	-1.55	-1.34	-2.72	898	-1.22	-0.45	-1.56	3,926	-0.76	-1.55	-2.01
Non-ferrous metals	11,380	-3.29	-1.47	-4.52	966	5.38	3.62	8.90	1,863	-4.94	-1.83	-6.39
Other metallic products	23,173	-1.72	-1.06	-2.68	1,389	6.70	6.48	13.46	1,201	-5.83	-3.33	-8.58
Machineries and tractors	27,024	-3.79	-3.94	-7.52	6,451	8.42	10.12	19.04	3,790	-7.70	-5.94	-12.88
Electrical machinery and apparatus	14,831	-0.18	0.40	0.28	3,338	1.44	1.59	3.06	1,529	-3.99	-1.11	-4.71
Electronic equipement	11,686	0.76	0.59	1.36	7,525	2.50	1.48	3.95	1,199	-2.34	-1.17	-3.25
Cars, trucks and buses	22,035	-3.02	-2.29	-5.47	2,294	16.91	28.68	48.26	4,019	-6.52	-1.32	-7.71
Other vehicles and parts	21,387	-3.91	-0.76	-4.52	5,357	-0.15	0.39	0.19	5,938	-7.61	-0.42	-7.61
Wood and furniture	14,058	-0.95	-0.17	-1.05	276	10.51	5.80	15.94	1,596	-4.51	-1.44	-5.64
Paper products, publishing	24,324	-0.45	-0.20	-0.61	1,265	2.61	1.82	4.43	1,981	-3.38	-1.11	-4.24
Rubber industry	7,564	-1.56	-1.88	-3.33	770	5.71	4.68	10.39	812	-5.30	-3.82	-8.50
Chemical (non-petro-chemical) elements	15,842	-1.26	-0.78	-1.96	1,906	5.72	4.30	10.07	1,037	-4.92	-1.64	-6.08
Refined petroleum and petro-chemical ind	56,218	-0.22	-0.15	-0.35	5,332	1.07	0.62	1.65	1,768	-3.73	-1.81	-5.26
Other chemical products	21,064	-0.33	-0.10	-0.35	2,353	2.93	2.29	5.27	972	-4.01	-2.06	-5.04
Pharmacy and perfume products	15,685	0.30	0.59	0.84	2,508	3.07	3.43	6.50	526	-3.80	-1.52	-4.94
Plastic products	10,252	-0.34	-0.18	-0.48	692	9.10	1.88	10.98	285	-4.21	-2.11	-5.96
Textiles	18,109	1.24	-0.98	0.20	1,466	7.50	6.00	13.57	1,144	8.04	-2.97	5.07
Wearing apparel	9,490	0.92	0.27	1.14	255	5.88	3.53	9.02	117	10.26	-1.71	8.55
Footwear, leather products	6,795	19.51	-1.04	18.20	302	7.62	1.32	8.28	3,019	26.40	-1.59	24.48
Coffee	10,534	-2.16	2.23	0.00	2	0.00	0.00	0.00	2,536	-3.55	3.35	-0.24
Tobacco	24,705	3.61	2.61	6.42	902	3.22	2.00	4.99	3,245	10.82	7.21	18.24
Meat products	21,654	0.31	1.77	1.98	219	9.59	3.20	12.33	1,515	-0.66	5.15	4.42
Dairy products	9,837	0.19	0.43	0.57	407	6.14	3.44	9.58	21	0.00	0.00	0.00
Sugar	8,219	19.36	-1.74	16.19	3	0.00	0.00	0.00	2,407	36.31	-3.74	30.20
Vegetable oils and fats	15,280	-0.49	2.08	1.54	347	8.36	1.44	9.51	2,831	-1.06	3.50	2.44
Other food products and beverages	32,004	0.31	0.41	0.70	1,267	3.39	5.52	8.76	1,187	-2.11	-0.84	-2.86
Other industries	8,520	-3.91	-2.36	-6.30	1,474	18.39	12.48	32.63	768	-8.07	-4.30	-11.85
Public utilities	39,658	0.02	-0.01	-0.01	942	0.74	0.42	1.06	0	0.00	0.00	0.00
Construction	121,784	0.47	0.60	1.09	0	2.07	1.46	3.46	0	0.00	0.00	0.00
Trade	113,654	0.04	0.02	0.06	849	10.01	7.77	13.07	648	-0.77	-0.46	-1.23
Transportation	54,675	-0.02	0.12	0.09	1,918	5.01	2.87	7.66	444	-0.68	-0.23	-1.13
Communication	26,083	-0.03	0.03	0.03	163	14.72	12.27	17.79	201	-2.49	-1.49	-3.98
Renting services	127,825	0.42	0.52	0.88	5	0.00	0.00	0.00	0	0.00	0.00	0.00
Public administration and defense, educa	173,001	-0.03	-0.02	-0.04	1,038	1.45	1.16	1.93	671	-1.94	-1.34	-3.13
Other services	232,023	-0.22	-0.05	-0.28	8,540	5.42	3.31	8.49	3,688	-1.11	-0.60	-1.65
TOTAL	1,522,491	0.03	0.06	0.09	69,065	4.76	4.23	9.02	65,501	0.06	-0.46	-0.25

Finally, the sectors with greater increments in imports are: Cars, truck and buses (48.26%), Other industries (32.63%), Machineries and tractors (19.04%) and Communication (19.79%).

4. Conclusions

In order to evaluate the impacts of the free trade agreements in a commercial block, it is necessary to consider the collateral effects that these agreements bring to each economy. In particular, the increase in Capital Flow may create new possibilities of production and trade and in a long run, it could establish a capital stock, which guarantees a higher rate of economic growth.

Following this vein, we propose a new relationship between the Foreign Capital Flow and the Expected (rate of) Foreign Reserves Lose for Brazil. The theoretical foundations for this assumption is that the Foreign Capital Flow is an investment decision made by rational and risk adverse financial agents. Since the foreign borrows and investments have to be backed by some collateral then the expected level of foreign reserves at the end of the period is taking as the

relevant (aggregate) variable for the investments. This relationship has a well-behaved shape in periods without significant crises and this allows us to evaluate the impact of a crisis on macroeconomic and sectorial variables.

With that relationship in hands we use a CGE model to analyse the impacts of a crisis in an economy, defining as crisis the situation where the actual value of the variable does not coincide with the expected value of it. Since 1998 was a year with a significant crisis we use the model to evaluate its impact.

We also use that endogenization of the foreign investment decision to evaluate the macroeconomic and sectorial impacts of the FTAA and EU trade agreement. To do this we use the version of the CGE model implemented by the Instituto de Pesquisas Econômicas Aplicadas (IPEA) which we recalibrate in order to purge the effect of the crisis in the evaluation of the gains of the agreements.

With respect to the experiment of purging the 1998 crises, our results show that the Foreign Reserves Lose allowed diminishing the negative impacts in GDP however the Trade Balance and the Government Deficits were high. The insertion of the Foreign Reserves in the form of Foreign Saving sustains the economy functioning. In the sectorial variables we can observe that the most affected sectors by the crises were “Other vehicles and parts”, “Footwear, leather products” and “Sugar”.

After purging the crisis effects in the CGE model we run the free trade agreements experiment in order to capture the real impacts of these agreements in a non-crises scenario. The results are quite different from those without purging the crises. For completeness, in appendix A2 we report the experiment without eliminating the crisis effects. We can note that the benefits of the trade agreements are better in a context without crises. For example there is an increasing of the GDP in the FTAA&EU agreement in about 4.81% in dollar. It result from the increasing in the GDP in “Real” and the valorisation of the local currency and this effect is also observed in the other agreements. Another interesting effect is that in each experiment the Government Deficit does not increase significantly and that in the FTAA and in the EU trade agreement there exist an increasing in foreign reserves. Also it is observed a greater increasing in Imports than in Exports; this increases the trade balance deficit. Finally, the more benefited sectors with the FTAA&EU agreement were “Sugar”, “Footwear, leather products” and “Tobacco”. The sectors with greater loses in that trade agreement were “Machineries and tractors” and “Other industries”.

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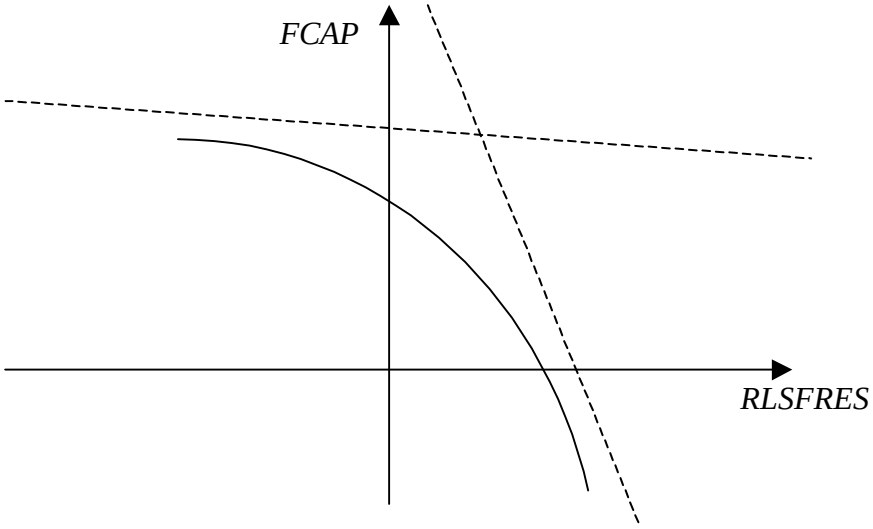
Appendix A1

In this appendix the relationship between the foreign capital flow (*FCAP*) and the expected rate of foreign reserves lose (*RLSFRES*) is estimated. The main difficulty is that the second variable is not observed and therefore it will be necessary to restrict us to periods where foreign investors had perfect prevision. We would expect that it is the case in periods without significant crises. As we saw in figure 2 there exist a very well behaved shape between *FCAP* and *RLSFRES* in periods without crises. So we can consider those periods as having perfect foresight, i.e. the expected rate of foreign reserves lose was self-fulfilled.

Firstly let us note that the function *f* has to be strictly decreasing (because of the risk adverse behavior of the investor) and concave (which implies a sort of decreasing marginal propensity to invest with respect to the rate of foreign reserves lose). Therefore the functional form of *f* will be taken as a hyperbolic function with axes inclination close to the co-ordinate axes as showed in figure A1.

Figure A1: Foreign Capital Flow Curve Shape



This shape is more flexible since it does not restrict to vertical and horizontal axes. It will allow high flow of foreign capital with no *apriori* bound. Analogously it does not put an exogenous bound on the rate of foreign reserves lose.

To estimate the function *f* it is used the least square method and the series were taken monthly with a period of one year backward from December 1995 to March 2003. The functional form used for *f* is:

$$f(RLSFRES^e) = a_1 + a_2 * RLSFRES^e - \sqrt{a_3 *.(RLSFRES^e)^2 + a_4 * RLSFRES^e + a_5}$$

The estimated parameter values for this functional form are given in table A1.

TABLE A1: FOREIGN CAPITAL CURVE PARAMETER VALUES					
Parameter	**a1**	**a2**	**a3**	**a4**	**a5**
Value	114,058.36	-112,269.57	10,632,748,770.85	-14,349,853,364.67	7,848,531,670.16

Appendix A2

In this appendix we report the results of the experiment made with the CGE model varying the tariffs and export prices to simulate the trade agreement and fixing the foreign investment decision and the foreign reserves lose in 1998. This will allows comparing our results of the trade agreements with those produced in an environment of crisis. Table A2 shows the import taxes and export price variations that simulate the international trade agreement. These values were estimated by Tourinho e Kume (2002) and also used in our work.

Table A2: Import taxes and export price variations of trade agreements						
Sectors	FTAA		EU		FTAA&EU	
	Import tax %	Price var. %	Import tax %	Price var. %	Import tax %	Price var. %
Agriculture	1.88		2.64	8.5	1.88	8.5
Minerals	2.73		2.73	0.71	2.73	0.71
Petroleum, natural gas, coal and other fuels	6.03		6.74		6.03	
Non-metallic minerals	9.71	5.24	5.6		4.32	5.24
Iron and steel industry	7.43	3.92	4.82	1.26	4.82	5.18
Non-ferrous metals	5.49		5.37	0.85	3.67	0.85
Other metallic products	8.31		7.39		3.5	
Machineries and tractors	8.08		4.92	0.11	2.27	0.11
Electrical machinery and apparatus	9.3		7.98	0.26	4.47	0.26
Electronic equipement	4.93		6.9		3.49	
Cars, trucks and buses	10.19		5.15	1.71	5.15	1.71
Other vehicles and parts	5.36		3.96	1.55	1.32	1.55
Wood and furniture	13.19		13.19	0.67	13.19	0.67
Paper products, publishing	3.07		2.94	0.86	1.47	0.86
Rubber industry	8.83		7.54		5.05	
Chemical (non-petro-chemical) elements	4.38		4.19	0.96	1.95	0.96
Refined petroleum and petro-chemical industry	5.71		6.13	0.21	4.39	0.21
Other chemical products	6.57		6.46	0.49	3.96	0.49
Pharmacy and perfume products	5.59		3.67		1.95	
Plastic products	9.05		14.44		9.05	
Textiles	9.2	7.77	8.61		7.02	7.77
Wearing apparel	18.06	10.04	18.06		18.06	10.04
Footwear, leather products	12.03	7.46	12.03	1.33	12.03	8.8
Coffee	8.82		8.82	4.22	8.82	4.22
Tobacco	4.25	15.36	4.25	9.24	4.25	24.6
Meat products	3.77		3.77	13.32	3.77	13.32
Dairy products	6.99	1.35	6.99		6.99	1.35
Sugar	5.71	13.47	5.71		5.71	13.47
Vegetable oils and fats	4.03	1.33	4.03	6	4.03	7.33
Other food products and beverages	9.02		5.33		5.33	
Other industries	8.24		9.3	0.4	4.26	0.4

With these new import taxes and export prices we proceed to recalculate the new equilibrium in 1998. Table A3 shows the macroeconomic impacts of the agreements in that crisis scenario.

Table A3 - Macroeconomic Impacts of trade agreements: Crisis scenario					
	Units	EQUIL. Value	FTAA %	EU %	FTAA&EU %
GDP	R$ millions	899,810	-0.1%	-0.1%	-0.2%
Investment	R$ millions	191,460	-2.6%	-2.7%	-5.4%
Private consumption	R$ millions	572,404	0.5%	0.6%	1.1%
Government expenditure	R$ millions	159,920	0.6%	0.8%	1.4%
Goods and services balance deficit	US$ millions	20,621	-0.1%	0.2%	0.0%
Exports	US$ millions	57,509	2.5%	2.2%	4.8%
Imports	US$ millions	78,130	1.8%	1.7%	3.5%
Services balance deficit	US$ millions	9,872	3.1%	0.5%	3.0%
Foreign saving	US$ millions	38,340	0.0%	0.0%	0.0%
Government deficit	R$ millions	66,853	6.8%	7.9%	15.1%
Entrepreneurs saving	R$ millions	61,147	0.0%	0.1%	0.1%
Households saving	R$ millions	42,185	0.5%	0.6%	1.1%
Exchange rate	R$/US$	1.163	-0.7%	0.5%	-0.3%
Composite price index		1.067	-0.2%	-0.2%	-0.4%
		Value	Value	Value	Value
Trade balance deficit	US$ millions	10,749	10,419	10,727	10,453
Foreign reserves lose	US$ millions	7,617	7,617	7,617	7,617

If we compare the results in this table with those of table 4 we can conclude that the free trade agreements are more convenient in a scenario with self-fulfilled expectations with respect to the rate of foreign reserves lose. In particular, we would expect that it would be the case in a scenario without crises. In table A3, when the foreign reserve lose and foreign capital flow are fixed, there is no increasing in foreign saving and the increasing in private consumption reduces the total investment implying a reduction in the GDP. Taking the foreign investment decision as an endogenous variable and introducing the long run relationship between investment and capital stock it results that the free trade agreements are more beneficial

Finally, table A4 describes the sectorial impacts of the free trade agreements in a crisis scenario. It has to be contrasted with the results reported in table 5 where the scenario is of financial stability.

Table A3: Sectorial impacts of the free trade agreements: Crisis scenario

SECTORS	Gross Product (X)				Imports (M)				Exports (E)			
	X Equil.	FTAA %	EU %	FTAA&EU %	M Equil.	FTAA %	EU %	FTAA&EU %	E Equil.	FTAA %	EU %	FTAA&EU %
Agriculture	111,996	1.0%	1.4%	2.4%	2,580	4.1%	-0.3%	4.0%	3,440	0.6%	5.9%	6.5%
Minerals	7,478	-1.3%	-0.4%	-1.8%	337	-0.9%	-1.2%	-2.1%	3,800	-1.4%	-0.2%	-1.8%
Petroleum, natural gas, coal and other fuels	5,801	-0.4%	0.1%	-0.4%	2,774	0.7%	-0.3%	0.5%	11	0.0%	0.0%	0.0%
Non-metallic minerals	20,493	-1.3%	-1.7%	-3.1%	602	-1.0%	0.8%	0.5%	835	4.7%	-1.1%	3.2%
Iron and steel industry	24,460	-0.4%	-0.8%	-1.3%	907	-1.2%	-1.0%	-2.2%	3,411	2.9%	1.1%	3.8%
Non-ferrous metals	10,869	-1.8%	-0.7%	-2.6%	1,125	1.6%	0.0%	1.6%	1,684	-2.1%	0.2%	-2.1%
Other metallic products	23,272	-1.5%	-1.3%	-3.0%	1,601	3.2%	2.9%	6.4%	1,046	-2.2%	-0.6%	-3.0%
Machineries and tractors	26,157	-2.8%	-3.5%	-6.5%	7,893	3.0%	5.0%	8.3%	3,214	-3.7%	-2.7%	-6.6%
Electrical machinery and apparatus	15,364	-0.7%	-0.4%	-1.2%	3,580	-0.1%	0.0%	-0.1%	1,392	-1.4%	0.9%	-0.6%
Electronic equipement	12,255	-0.1%	-0.4%	-0.7%	8,179	0.6%	-0.4%	0.2%	1,121	-0.4%	0.4%	-0.3%
Cars, trucks and buses	20,539	-1.2%	-2.2%	-3.5%	4,003	1.3%	13.1%	14.8%	3,289	-1.6%	1.6%	-0.3%
Other vehicles and parts	19,575	-1.2%	0.5%	-0.8%	5,406	-0.1%	-0.2%	-0.4%	4,761	-1.7%	3.8%	1.7%
Wood and furniture	14,082	-0.7%	-0.2%	-1.0%	380	2.1%	-1.3%	0.8%	1,433	-1.7%	0.9%	-0.9%
Paper products, publishing	23,825	0.1%	0.3%	0.4%	1,325	1.4%	0.8%	2.3%	1,776	-0.7%	1.4%	0.6%
Rubber industry	7,100	-0.3%	-0.7%	-1.0%	833	3.2%	2.6%	6.1%	673	-0.9%	0.1%	-0.9%
Chemical (non-petro-chemical) elements	15,230	-0.3%	0.1%	-0.3%	2,123	2.9%	1.8%	4.9%	872	-0.8%	2.2%	1.3%
Refined petroleum and petro-chemical industry	55,584	0.0%	0.1%	0.1%	5,418	0.6%	0.2%	0.9%	1,556	-0.7%	1.0%	0.2%
Other chemical products	20,689	0.0%	0.2%	0.3%	2,460	1.7%	1.3%	3.0%	843	-0.7%	0.9%	0.9%
Pharmacy and perfume products	15,736	0.4%	0.6%	1.1%	2,665	1.8%	2.2%	4.1%	464	-0.4%	1.3%	0.9%
Plastic products	10,271	-0.6%	-0.3%	-0.9%	775	5.8%	-0.8%	5.0%	253	-1.6%	0.4%	-1.2%
Textiles	17,325	1.9%	0.1%	2.0%	1,697	3.6%	2.7%	6.5%	968	12.1%	0.8%	13.0%
Wearing apparel	9,543	0.9%	0.3%	1.3%	303	1.7%	0.0%	1.7%	104	13.5%	1.0%	14.4%
Footwear, leather products	5,293	17.6%	4.1%	23.8%	302	5.0%	1.0%	6.6%	2,077	27.8%	6.4%	37.3%
Coffee	9,920	-0.3%	3.2%	2.8%	3	0.0%	0.0%	0.0%	2,288	-0.7%	5.3%	4.5%
Tobacco	24,222	3.8%	2.9%	7.1%	998	0.9%	-0.1%	0.8%	2,997	12.7%	8.9%	22.2%
Meat products	21,424	0.6%	2.0%	2.5%	283	2.8%	-2.5%	0.7%	1,455	0.3%	6.0%	6.4%
Dairy products	9,845	0.4%	0.5%	0.9%	488	1.6%	-0.4%	1.4%	19	0.0%	0.0%	0.0%
Sugar	7,326	16.3%	1.1%	17.9%	3	0.0%	0.0%	0.0%	1,885	36.6%	1.9%	39.5%
Vegetable oils and fats	14,691	0.6%	2.8%	3.4%	450	1.8%	-3.8%	-1.8%	2,638	0.9%	4.9%	5.8%
Other food products and beverages	31,768	0.6%	0.7%	1.3%	1,399	1.0%	3.4%	4.4%	1,073	0.4%	1.4%	1.8%
Other industries	8,179	-2.9%	-1.6%	-4.7%	1,884	11.1%	6.3%	18.6%	645	-3.9%	-0.6%	-4.8%
Public utilities	39,617	0.1%	0.1%	0.2%	960	0.3%	0.0%	0.3%	0			
Construction	138,259	-2.3%	-2.3%	-4.8%	0	-1.9%	-2.6%	-4.6%	0			
Trade	113,307	0.1%	0.1%	0.2%	981	6.2%	4.4%	6.2%	631	-0.2%	0.0%	-0.2%
Transportation	54,510	0.1%	0.2%	0.3%	2,206	1.5%	-0.2%	1.4%	433	-0.2%	0.2%	0.0%
Communication	26,098	0.1%	0.1%	0.2%	189	10.6%	9.0%	10.6%	186	-0.5%	0.5%	0.0%
Renting services	128,693	0.4%	0.5%	0.9%	6	0.0%	0.0%	0.0%	0			
Public administration and defense, education an	172,940	0.0%	0.0%	0.0%	1,059	0.9%	0.7%	0.9%	638	-0.8%	-0.2%	-0.9%
Other services	231,982	-0.1%	0.0%	-0.1%	9,955	1.6%	-0.1%	1.5%	3,596	-0.3%	0.1%	-0.3%
TOTAL	1,525,717	0.0%	0.0%	-0.1%	78,130	1.8%	1.7%	3.5%	57,509	2.5%	2.2%	4.8%

Appendix A3: List of equations of the CGE model