From fixed to flexible exchange rates: the case of india

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Abstract

The Indian Government changed its exchange rate regime quite a number of times in the first half of the 1990s. From a more or less a fixed exchange rate regime upto early 1992 the exchange rate was fully convertible in the current account by 1995. Between 1990 and 1995 there was a period when the exchange rate was operating under the liberalised exchange rate management system, a period when the rupee was fully convertible in the trade account but not the current account and a period when there was full convertibility in the current account. This paper takes a simple empirical look at the nominal exchange rate during the period of economic liberalization. The objective of this paper is to analize whether there were clear structural breaks at the level in the periods when the regimes changed. This paper suggests that neither the introduction of LERMS nor the introduction of full convertibility in the current account had any significant effect on the exchange rate. The exchange rate was on the other hand fully adjusted by the policies taken before them. The two policies crucial in this regard were the devaluation of July, 1991 and the trade account convertibility of February, 1993. Once these policies were undertaken the actual policy announcements were simply formal in nature.

From Fixed to Flexible Exchange Rates: The Case of India

1. Introduction

The government of India's New Economic Policy of 1991 had two parts. The main aim was to change the structure of the economy from a government oriented one to a market oriented one. This was the long term objective which was expected to be implemented in phases over a period of ten or twenty years. The other objective was to stabilise the economy while the policies are being implemented. These policies mostly consisted of monetary and fiscal policies and were clearly short term in nature implemented from time to time and adjusted or withdrawn according to the prevailing situation at any point of time.

The journey from a mixed economy with socialistc objectives to a free market economy with competitive objectives has to be an extremely tedious one anywhere in the world. For a country as massive and as complex and chaotic as India it is natural to expect the journey to be next to impossible. However apparently that is not what the policy makers thought when they embarked upon this perilous path in 1991. Neither did they have any choice as the policies were a part of the conditionalites of a massive loan that came form the IMF in 1990.

The IMF's liberalization package touched upon every aspect of the economy. Since simultaneous implementation of all of them was not feasible a question of sequentiality in the policies came to the fore and was much discussed by economists in the early 1990s. One of the first policies to be implemented was the exchange rate policy. It should be understood that before the decade of the 1990s India's exchange rate was more or less fixed. Between 1947 and 1975 the rupee was pegged to the pound sterling after which it was pegged to a basket of currencies[1]. The Reserve bank of India announced the exchange rates on the basis of the daily exchange rate movements of a select number of currencies (of India's major trading partners). The fluctuations were intended mainly to keep the real exchange rate constant.

From this system of fixed (or "implicitly adjustable peg") exchange rate the Indian government shifted to a flexible exchange rate system (in the current account) by 1992-93. However the shift was not achieved overnight. In fact the Indian government took a series of policies to minimise the impact of the change on the exchange rate. This paper analyses the impact of these intermediate policy measures on the Indian exchange

[1] There was a period in 1971 when the rupee was pegged to the dollar rather than the sterling at Rs 7.5 to the dollar. The sterling peg returned from January 1972 and continued till September 1975. In June 1972 the sterling started to float so that the peg implied that the value of the rupee had to be kept stable with respect to the (floating) sterling.

rate. More specifically we ask the following question: what is the exact path that the Indian exchange rate took in its journey from the government determined rate to the "equilibrium" rate[2]. The theoretical model implicitly assumed throughout the paper is discussed in section 2. In section 3 we look at the nominal exchange rate to determine the path. Section 4 concludes the paper[3].

2. The Theory

The government of India took its first step towards full convertibility in the current account on July 1 1991 when it devalued the rupee. The exchange rate prevailing in June 1991 was about Rs 21.1 per US dollar. As we have already argued this exchange rate was fully controlled by the government and can be considered as virtually fixed from the free market point of view. In figure 1, where we have drawn the standard textbook representation of the foreign exchange market, we denote this fixed exchange rate as $\underline{e}$.

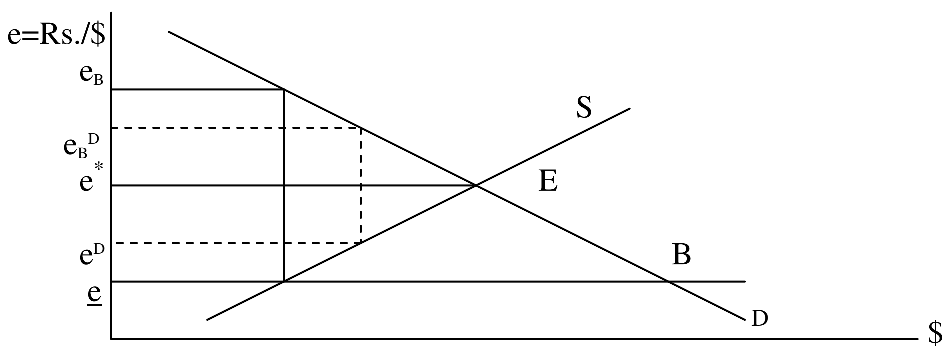


Figure - 1

At this exchange rate there is an excess demand of US dollars to the extent of AB. Had markets been free this excess demand for dollars would have driven up the relative price of dollars and driven down the relative price of rupees. The final outcome should have been an exchange rate of e^*. The government, by law, had prevented the attainment of e^* – this being the essence of the "fixed" exchange rate system as applied to India. What is the value of e^*? Given a fixed or a government controlled exchange rate system, e^* is unobservable so its value is unknown. Can we approximate it? In this paper we will approximate the value of e^* by the value that India's exchange rate attained as soon as the rupee was made fully convertible in the current account. The rupee was made fully

[2] As pointed out by a referee the word "equilibrium" should be treated with caution here. It should be clarified that under flexible exchange rates monetary authorities do not face a balance of payments problem. However in India, after the current account was fully freed, imbalance in the current account persisted implying thereby that the prevailing exchange rate, even after complete flexibility in the current account, was still not the true equilibrium exchange rate. It was some version of what economists call the "dirty float". Several factors (such as, exchange rate volatility or a rise in capital mobility) can force governments to "manage" exchange rates. To see how the RBI has intervened in India's foreign exchange market in the post 1993 period, see, for example, Kohli (2000).

[3] Since the econometric methodology of the paper is standard textbook material it is relegated to appendix 1. This will also help us to talk about the issue at hand without unnecessary interruptions.

convertible in the current account in August 1994. In August 1994 the value of the rupee was exactly Rs 31.3 to the US dollar. If we allow for a one month lag for the exchange rate to adjust fully to convertibility then instead of August we can take September of the same year. In September 1994 the value of the rupee was approximately Rs 31.4 to the dollar. So a reliable estimate of e^* can be taken to be between Rs 31.3 and Rs 31.4 per US dollar.

Let us now turn to the Indian government's dilemma as soon as the policy of flexible exchange rate was decided upon. $\underline{e}$ was observable at Rs 21.1 per US dollar, e^* was unobservable and, at that time there was no way of finding out exactly what it would be like. Luckily however there was another alternative available. If $\underline{e}$ is the fixed exchange rate (and making the simplified assumption of nonexistence of Hawala transactions[4]) there should be a black market exchange rate of e_B prevailing in the market. This e_B was observable at about Rs 40 to the US dollar (at its minimum)[5]. Since e^* is surely to be between $\underline{e}$ and e_B, the range in which e^* should be found could be ascertained. The range was a massive Rs 20 to the US dollar. Thus any sudden change in policy towards full convertibility was expected to cause large scale macroeconomic instability. The attainment of e^* was thus obtained by a series of policies which would make the change more gradual.

The major exchange rate policies undertaken by the government of India between 1991 and 1994 were:

1) Rupee devalued by 8 % in July 1, 1991.
2) Rupee devalued by 11% in July 3, 1991.
3) The rupee made partially convertible on March 1992 in the trade account, with the introduction of liberalised Exchange Rate Management System (LERMS). Under the system, 40 % of all foreign exchange earnings was to be surrendered at the official exchange rate, remaining 60 % could be converted at a market determined rate. The foreign exchange surrendered at official exchange rate was utilised to import essential items. The foreign exchange converted at the market rate was available to finance all other imports.
4) The Foreign Exchange Regulation Act (FERA), 1973 was amended on January 1993.
5) The dual exchange rate system of March 1992 unified. Rupee made fully convertible on the trade account on February 1993.
6) Full convertibility of rupee on the current account. Art VIII status of IMF attained in August 1994.

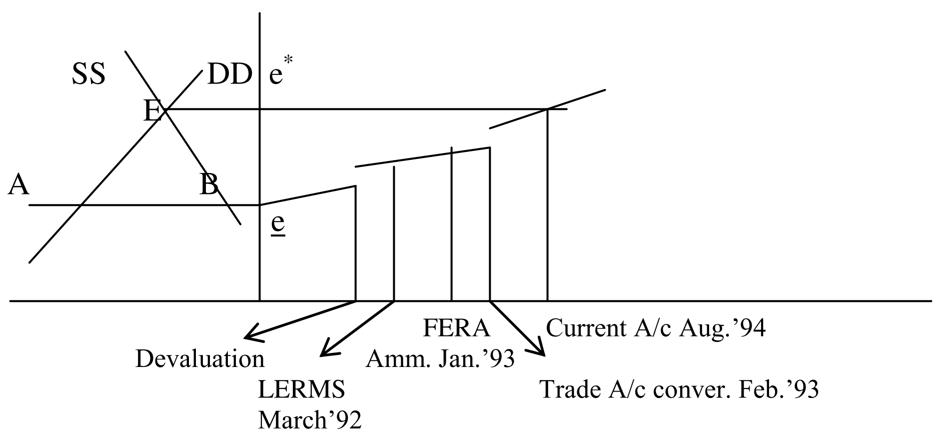
Policies 1 to 5 were expected to close the gap between e^* and $\underline{e}$ sufficiently so that by the time policy 6 (full convertibility in the current account) is taken there will be no sudden

[4] I am indebted to Pabitra Giri for pointing this out to me.
[5] See Siddiki (2002)

jolt on the exchange rate. As is obvious from figure 1 this would automatically close the gap between e^* and e_B so that the black market of exchange rates should ideally vanish.

3. Empirical Findings[6]

Given the above theoretical perspective we will pose two related empirical questions in this section. First, how exactly did the exchange rate react to these policy changes and hence, how many of these were necessary from the exchange rate's point of view alone. Table 1 and figure 2 summarizes the findings of a simple (dummy variable) structural break analysis on India's nominal rupee/US dollar exchange rate (see appendix 1 and 2 for the methodology and the detailed results). Since policies often take time to



have their effects, we have calculated the instantaneous effects as well as effects after a lag of one period (month). It is obvious from the table that only devaluation and trade account convertibility had any significant (at 5% level) effect on the exchange rate. As expected the effect of devaluation was instantaneous. However the effect of trade account

Table 1: Structural break on India's Nominal (Rs./$) Exchange rate

Policy	Intercept[3]		Slope[3]	
	λ_0[1]	λ_1[2]	λ_0	λ_1
Devaluation	+	=	+	=
LERMS	=	=	=	=
FERA	=	=	=	=
Trade A/c convertibility	=	+	=	+
Current A/c convertibility	=	=	=	=

Notes: 1. λ_0 = Result without lag, 2. λ_1 = Result with one period lag, 3. '+' implies change at 5% level, '=' implies no change at the same level.

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[6] See Bratin Bhattacharyya, "Liberalization of India's foreign exchange and its impact on exports", A project submitted to the Department of Business Management, Calcutta University, 1996, for a similar analysis with slightly different conclusions. The exchange rate data has been taken from the *International Trade Statistics Yearbook* (various issues) published by the IMF.

convertibility came after a lag of one month. This immediately implies two things. First that the government had successfully attained e^* with trade account convertibility and hence when the current account was finally made convertible there was no immediate jolt to the exchange rate. Secondly, initiation of the LERMS and amendment of FERA were redundant policies as far as the exchange rate is concerned. Let us study each of these conclusions in turn.

The empirical results as far as the policies that mattered are reported below. Turning first to devaluation we find:

$$NOM = \underset{(5.9^*)}{8.01} + \underset{(9.4^*)}{.16}\, t + \underset{(9.02^*)}{4.45}\, ID_1$$

$$\bar{R}^2 = .99,\ F\,(3,115) = 9338.7^{*7}$$

and,

$$NOM = \underset{(8.7^*)}{9.31} + \underset{(8.7^*)}{.14}\, t + \underset{(8.9^*)}{.058}\, SD_1$$

$$\bar{R}^2 = .99,\ F\,(3,115) = 9310.2^{*8}$$

Where NOM is the Nominal (monthly) exchange rate, ID_1 and SD_1 are the intercept and slope dummies for devaluation (July 1991) and the figures in brackets are the t values[9]. The thing to note about the figures is that there has been a change both in intercept and slope. While the first finding is obvious, the second finding is not. Why was there a structural break in the slope? A harder look at the nominal exchange rate series reveals the following: the exchange rate was frequently adjusted with the basket of currencies in the pre devaluation period but no such adjustment took place in the immediate post devaluation period. Thus the exchange rate was virtually fixed immediately after the devaluation resulting in a significant decline in slope for the series. The structural break in slope is a reflection of this fact[10]. As far as trade account convertibility is concerned, the results are as follows:

$$NOM = \underset{(2.09^*)}{6.97} + \underset{(5.3^*)}{.17}t + \underset{(10.8^*)}{4.85}\, ID_{42}$$

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2. Cochrane-Orcutt iterative method of order 1. The estimated residual equation is: $U_t = \underset{(27.9^*)}{.91}\, U_{t-1} t\, \varepsilon_t$

(the figure in bracket is the t-value).

[8] $U_t = \underset{(22.54^*)}{.89}\, U_{t-1} + \varepsilon_t$

[9] Throughout this paper '*' implies that the relevant alternative hypothesis is accepted at the 5% level.

[10] Fitting a regression equation for the pre and the post devaluation periods can easily determine this. The results are not reported here.

$$\bar{R}^2 = .99,\ F(3,115) = 10978.9^{*11}$$

$$\text{and,}\quad \underset{(1.75)}{NOM = 7.53} + \underset{(3.9^*)}{.16t} + \underset{(10.62^*)}{.05\ SD_{42}}$$

$$\bar{R}^2 = .99,\ F(3,115) = 10730.0^{*12}$$

Where ID_{42} and SD_{42} are the intercept and slope dummies for trade account convertibility with one period lag. Here of course the change in slope is expected as the exchange rate is being subjected more to the vagaries of the market. An interesting point to note about the results is that the t values are larger for trade account convertibility than for devaluation.

Let us now turn to the case of the relative unimportance of current account convertibility and the importance of trade account convertibility. Table 2 shows India's overall balance of payments in the 1990s. It can be seen that (a) the net invisibles were positive (tending to exert a positive effect on the rupee) and (b) the absolute magnitude of net invisibles was only about one third the absolute value of net balance of trade. If we

Table 2: India's Overall Balance of Payments in US Dollars

	Item	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96
I.	**Merchandise**						
	A) Exports, f.o.b.	18477	18266	18869	22683	26855	32311
	B) Imports, c.i.f.	27914	21064	24316	26739	35904	43670
	Trade Balance (A-B)	**-9437**	**-2798**	**-5447**	**-4056**	**-9049**	**-11359**
II.	**Invisibles, net**	**-243**	**1620**	**1921**	**2898**	**5680**	**5449**
III.	**Current Account (I+II)**	**-9680**	**-1178**	**-3526**	**-1158**	**-3369**	**-5910**

Source: Hand book of Statistics on Indian Economy, Reserve Bank of India (2001)

add to this the overwhelming importance of trade account transactions (exports and imports) relative to transactions in invisibles in the current account the unimportance of current account convertibility seems to be an expected result. Of course, other factors (especially open market buying and selling of dollars by the Reserve Bank) may have played their role, but that is not obvious from the data.

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[11] $U_t = \underset{(43.14^*)}{.96}\ U_{t-1} + \varepsilon_t$

[12] $U_t = \underset{(44.61^*)}{.97}\ U_{t-1} + \varepsilon_t$

While the relative unimportance of current account convertibility can be accounted for to a certain extent, the unimportance of LERMS is solely due to the fact that the exchange rate studied here is the official rate and not the market rate. It should however be noted that India's foreign exchange reserves had improved substantially (to about 10 billion dollars) by 1992-93 so that the Reserve Bank was perfectly capable of selling dollars in the open market to stop its slide if it so wished. In fact, the Reserve Bank has consistently intervened in the foreign exchange market in the post-float period to stabilise the rupee. The unimportance of FERA can be accounted for by the set of arguments.

4. Conclusion

The Indian government took two major steps in making its currency fully convertible in the current account. First it switched on to the LERMS in March, 1992 which made the currency partially convertible. As a second step full convertibility was achieved in August, 1994. This paper suggests that none of these policies had any significant effect on the exchange rate. The exchange rate was on the other hand fully adjusted by the policies taken before them. The two policies crucial in this regard were the devaluation of July, 1991 and the trade account convertibility of February, 1993. Once these policies were undertaken the actual policy announcements were simply formal in nature. This suggests a system of good governance by the Reserve Bank of India and a proper sequencing of the policies so that exchange rate flexibility could be achieved with the minimum possible hurdle.

Appendix 1

Methodology of the structural break analysis

(See, for example, G.S. Maddala, *An Introduction to Econometrics*, p306-315.)

I Break in Intercept:

Original equation:

$X=\alpha_0 + \beta_0 T$

Changed Equation:

$X=\alpha_0 + \beta_0 T + (\alpha_1 - \alpha_0) D$

Where $D=0$ for $T< T^*$
$=1$ for $T\geq T^*$ (T^* being the expected date of the break)

II Break in Slope:

Original equation:

$X=\alpha_0 + \beta_0 T$

Changed Equation:

$X=\alpha_0 + \beta_0 T + (\beta_1 - \beta_0) DT$

Where D=0 for T< T^*
=1 for T≥ T^* (T^* being the expected date of the break)

III Simultaneous break in Intercept as well as slope:

Original equation:

$X=\alpha_0 + \beta_0 T$

Changed Equation:

$X=\alpha_0 + \beta_0 T + (\alpha_1 - \alpha_0) D + (\beta_1 - \beta_0) DT$

Where D=0 for T< T^*
=1 for T≥ T^* (T^* being the expected date of the break)

Appendix 2

Detailed results for the structural breaks[13]

(Note: ID= Intercept dummy, SD= Slope dummy. Subscript 1= devaluation, 2= LERMS, 3=FERA 4=Trade account convertibility, 5= Current account convertibility. Subscript 12=One period lag and similarly for 22,32,42,52.)

1. $NOM = 8.01 + .16t + 4.45\ ID_1$
   $(5.9^*)\quad (9.4^*)\quad (9.02^*)$

$\bar{R}^2 = .99$, $F(3,115) = 9338.7^*$ Regression Method: CO (1): $U_t = .91\ U_{t-1}+\varepsilon$ (27.9^*)

2. $NOM = 5.08 + .23t + .17\ ID_{12}$
   $(1.8)\quad (7.0^*)\quad (.25)$

$\bar{R}^2 = .99$, $F(3,115) = 5445.9^*$ Regression Method: CO(1): $U_t = .94\ U_{t-1}+\varepsilon$ (34.34^*)

3. $NOM = 9.31 + .14t + .058\ SD_1$
   $(8.7^*)\quad (8.7^*)\quad (8.9^*)$

$\bar{R}^2 = .99$, $F(3,115) = 9310.2^*$ Regression Method: CO(1): $U_t = .89\ U_{t-1}+\varepsilon$ (22.54^*)

4. $NOM = 5.10 + .23t + .002\ SD_{12}$
   $(1.7)\quad (6.5^*)\quad (.19)$

[13] CO(1)=Cochrane Orcutt iterative procedure of order 1. '*' implies the alternative hypothesis is accepted at 5% level.

$\bar{R}^2$ = .99, F (3,115) = 5444.5* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (33.69*)

5. NOM = 4.72 + .23t + -.18 ID_2
(1.57) (6.9*) (-.28)

$\bar{R}^2$ = .99, F (3,115) = 5446.7* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (36.26*)

6. NOM = 4.77 + .23t + -.14 ID_{22}
(1.6) (6.9*) (-.22)

$\bar{R}^2$ = .99, F (3,115) = 5445.2* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (36.20*)

7. NOM = 4.63 + .23t + -.002 SD_2
(1.49) (6.6*) (-.33)

$\bar{R}^2$ = .99, F (3,115) = 5448.1* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (36.19*)

8. NOM = 4.69 + .23t + -.002 SD_{22}
(1.53) (6.7*) (-.26)

$\bar{R}^2$ = .99, F (3,115) = 5446.3* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (36.12*)

9. NOM = 4.79 + .23t + -.11 ID_3
(1.62) (7.05*) (-.18)

$\bar{R}^2$ = .99, F (3,115) = 5444.3* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (36.38*)

10. NOM = 4.75 + .23t + -.16 ID_{32}
(1.6) (7.0*) (-.25)

$\bar{R}^2$ = .99, F (3,115) = 5445.7* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (36.53*)

11. NOM = 4.75 + .23t + -.0013 SD_3
(1.59) (6.9*) (-.20)

$\bar{R}^2$ = .99, F (3,115) = 5444.7* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (36.35*)

12. NOM = 4.71 + .23t + -.0017 SD_{32}
(1.56) (6.9*) (-.26)

$\bar{R}^2$ = .99, F (3,115) = 5446.1* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (36.51*)

13. NOM = 4.75 + .23t + -.157 ID_4
(1.6) (7.04*) (-.24)

$\bar{R}^2$ = .99, F (3,115) = 5445.7* Regression Method: CO(1): U_t = .94 $U_{t-1}+\varepsilon$ (36.53*)

14. NOM = 6.97 + .17t + 4.85 ID_{42}
(2.09*) (5.3*) (10.8*)

$\bar{R}^2$ = .99, F (3,115) = 10978.9* Regression Method: CO(1): U_t = .96 U_{t-1}+ε (43.14*)

15. NOM = 4.71 +3.01t + -.0017 SD_4
(1.56) (6.9*) (-.26)

$\bar{R}^2$ = .99, F (3,115) = 5446.1* Regression Method: CO(1): U_t = .94 U_{t-1}+ε (36.51*)

16. NOM = 7.53 + .16t + .05 SD_{42}
(1.75) (3.9*) (10.62*)

$\bar{R}^2$ = .99, F (3,115) = 10730.0* Regression Method: CO(1): U_t = .97 U_{t-1}+ε (44.61*)

17. NOM = 4.73 + .23t + -.0033 SD_5
(1.63) (7.3*) -.597)

$\bar{R}^2$ = .99, F (3,115) = 5459.8* Regression Method: CO(1): U_t = .94 U_{t-1}+ε (36.22*)

18. NOM = 4.74 + .23t + -.36 ID_5
(1.6) (7.3*) (-.57)

$\bar{R}^2$ = .99, F (3,115) = 5458.5* Regression Method: CO(1): U_t = .94 U_{t-1}+ε (36.21*)

19. NOM = 4.81 + .23t + -.227 ID_{52}
(1.68) (7.32*) (-.35)

$\bar{R}^2$ = .99, F (3,115) = 5448.9* Regression Method: CO(1): U_t = .94 U_{t-1}+ε (36.17*)

20. NOM = 4.73 + .23t + -.0033 SD_5
(1.63) (7.3*) (-.59)

$\bar{R}^2$ = .99, F (3,115) = 5459.8* Regression Method: CO(1): U_t = .94 U_{t-1}+ε (36.22*)

21. NOM = 4.80 + .23t + -.0021 SD_{52}
(1.67) (7.3*) (-.378)

$\bar{R}^2$ = .99, F (3,115) = 5449.6* Regression Method: CO(1): U_t = .94 U_{t-1}+ε (36.17*)

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