

LIST OF APPENDICES

- APPENDIX A:** Supplementary Data Tables
- APPENDIX B:** Unit Root Tests
- APPENDIX C:** The Bulgarian Banking System, 1987-1997
- APPENDIX D:** Some Stylized Facts
- APPENDIX E:** Summary Charts
- APPENDIX F:** Interest Rate Policy and Stabilization, Addendum to the Literature Review
- APPENDIX G:** Ratio of Domestic to Foreign Currency Holdings, Optimality Conditions
- APPENDIX H:** Political Instability in Bulgaria, 1990-1997
- APPENDIX I:** References and Data Sources

APPENDIX A: Supplementary Data Tables

- Table A-1: Money Supply and Components, 1991-97
- Table A-2: Money Multiplication, Refinancing and Domestic Credit, 1991-1997
- Table A-3: Real GDP Growth in Transition Economies, 1991-1997
- Table A-4: Consumer Price Inflation in Transition Economies, 1991-1997
- Table A-5: Broad Money Growth in Transition Economies, 1991-1997
- Table A-6: Dollarization Ratio in Transition Economies, 1991-1997
- Table A-7: Growth in Domestic Credit and Central Bank Refinancing, January 1996-March 1997, Lev Only
- Table A-8: Growth in Domestic Credit and Central Bank Refinancing, January 1996-March 1997, Foreign Currency
- Table A-9: General Government Budget, Cash Basis Reporting, 1991-96
- Table A-10: Gross Foreign Debt and Indicators, 1991-96
- Table A-11: Bulgaria's Balance of Payments, 1991-96
- Table A-12: Issues of Bad Debts Government Bonds, 1991-1995
- Table A-13: Structure of Domestic Government Debt
- Table A-14: Non-performing Loans and Liquidity Crises in a Sample of Transition Economies, 1990-1997
- Table A-15: Fiscal and Quasi Fiscal Costs of Banking Crises in a Sample of Transition Economies, Percent of GDP
- Table A-16: Fiscal Expenditures due to Banking Crises and Fiscal Deficit in a Sample of Transition Economies, Percent of GDP, 1991-1997

Table A-17: Augmented Dickey-Fuller Tests (No Intercept, No Trend)

Table A-18: Augmented Dickey-Fuller Tests (Intercept, No Trend)

Table A-19: Augmented Dickey-Fuller Tests (Intercept, Trend)

Table A-20: The Bulgarian Banking System, 1987-1997

Table A-1: Money Supply and Components, 1991-97

	1991	1992	1993	1994	1995	1996	1997.Q1	1997
Inflation (CPI based)	490.1%	79.4%	63.8%	121.9%	32.9%	310.8%	452.3%	581.9%
Broad Money, M2	108,432	154,982	229,922	409,109	571,305	1,244,566	2,954,500	5,538,774
Growth in broad money	121.3%	42.9%	48.4%	77.9%	39.6%	117.8%	137.4%	345.0%
Real broad money	20,761	16,539	14,975	12,006	12,617	6,690	2,876	4,367
Growth in real broad money	-57.8%	-20.3%	-9.5%	-19.8%	5.1%	-47.0%	-57.0%	-34.7%
Lev Component	68,702	117,459	186,318	280,936	421,275	644,387	1,045,631	3,287,867
Growth in Lev component	58.9%	71.0%	58.6%	50.8%	50.0%	53.0%	62.3%	410.2%
Real Lev component	13,154	12,535	12,135	8,245	9,303	3,464	1,018	2,592
Growth in real Lev component	-69.7%	-4.7%	-3.2%	-32.1%	12.8%	-62.8%	-70.6%	-25.2%
Lev component as % of total	63.4%	75.8%	81.0%	68.7%	73.7%	51.8%	35.4%	59.4%
Lev Deposits								
Demand deposits	15,024	19,565	23,152	36,633	46,271	110,167	197,352	952,781
Time deposits	25,867	59,409	109,966	164,954	255,570	326,153	491,532	796,147
Saving deposit	15,945	20,217	28,049	40,851	57,819	81,606	91,161	224,833
Total Lev Deposits	56,836	99,191	161,167	242,438	359,660	517,926	780,045	1,973,761
Currency outside banks	11,866	18,268	25,151	38,498	61,615	126,461	265,586	1,314,106
Currency-to-deposit ratio (Lev only)	0.21	0.18	0.16	0.16	0.17	0.24	0.34	0.67
Foreign Currency Component¹	39,730	37,523	43,604	128,173	150,030	600,179	1,908,869	2,250,907
Growth in FC component	589.2%	-5.6%	16.2%	193.9%	17.1%	300.0%	218.0%	275.0%
FC component as % of total	36.6%	24.2%	19.0%	31.3%	26.3%	48.2%	64.6%	40.6%
FC component in U.S. dollars	1,816	1,532	1,333	1,942	2,122	1,232	1,202	1,267
Growth in FC component in U.S. dollars	-9.8%	-15.6%	-13.0%	45.7%	9.3%	-42.0%	-2.4%	2.9%

Notes: ¹ In Lev equivalent, deposits only

Sources: BNB monthly bulletins

Table A-2: Money Multiplication, Refinancing and Domestic Credit, 1991-1997

	1991	1992	1993	1994	1995	1996	1997.Q1	1997
Reserve Money ¹	29,631	44,655	54,477	84,953	128,863	247,180	608,451	2,166,201
Growth in reserve money	-4.8%	50.7%	22.0%	55.9%	51.7%	91.8%	146.2%	776.4%
Lev component	29,145	43,002	52,003	80,681	121,302	232,699	469,212	2,031,805
Foreign currency component	486	1,653	2,474	4,272	7,561	14,481	139,239	134,396
Currency outside banks	13,797	21,534	28,408	43,080	68,649	138,176	298,932	1,419,810
Bank Reserves								
Required reserves	3,669	7,731	11,942	34,536	54,729	110,577	243,205	443,667
Excess reserves	12,165	15,390	14,127	7,337	5,485	-1,573	66,314	302,724
Total Bank Reserves	15,834	23,121	26,069	41,873	60,214	109,004	309,519	746,391
Money Multiplier	3.66	3.47	4.22	4.82	4.43	5.04	4.86	2.56
Lev Only	2.36	2.73	3.58	3.48	3.47	2.77	2.23	1.62
Currency-to-Deposit Ratio	0.14	0.16	0.14	0.12	0.13	0.12	0.11	0.34
Lev Only	0.21	0.18	0.16	0.16	0.17	0.24	0.34	0.67
Commercial Bank Refinancing	18,894	16,232	23,049	35,129	28,472	165,862	260,756	284,663
Collateralized Loans	1,432	7,952	7,947	23,810	3,133	6,150	1,000	0
Overdraft	0	0	1,186	4,631	5,626	61,147	374	0
Unsecured Loans	17,462	7,178	9,305	934	15,487	58,073	137,711	152,729
Foreign Currency Loans	0	1,102	4,611	5,754	4,226	40,492	121,671	131,934
Domestic Credit Expansion	167,271	254,022	396,819	543,224	634,674	2,010,510	4,908,431	5,136,474
Claims on Non-Government Sector ²	114,277	152,668	202,699	266,497	351,320	1,109,165	2,672,715	3,494,914
In Lev	68,928	91,673	101,090	149,250	202,968	234,546	234,689	931,545
In Foreign Currencies	45,349	60,995	101,609	117,247	148,352	874,619	2,438,026	2,563,369
Claims on the Government	52,994	101,354	194,120	276,727	283,354	901,345	2,235,716	1,641,560
In Lev	16,232	34,250	103,137	119,963	212,949	422,263	634,750	104,055
In Foreign Currencies	36,762	67,104	90,983	156,764	70,405	479,082	1,600,966	1,537,505
Claims on the Government as Percentage of Total	31.7%	39.9%	48.9%	50.9%	44.6%	44.8%	43.9%	42.1%

Notes: ¹ Excluding other deposits of non-bank institutions and households

² Private sector and non-financial public enterprises

Sources: BNB, Monthly Bulletins, <http://www.bnb.bg>

Table A-3: Real GDP Growth in Transition Economies, 1991-1997

(Annual Growth Rate in Percent)	1991	1992	1993	1994	1995	1996	1997
Bulgaria	-11.7	-7.3	-2.2	1.8	2.1	-10.9	-6.9
Central & Eastern Europe & Baltics*							
Average	-13.4	-10.5	-3.5	2.4	4.5	3.3	2.5
Median	-12.1	-7.3	-1.5	2.9	4.3	3.9	4.4
Highest	-7.0	2.6	9.6	9.4	8.9	9.1	10.8
Lowest	-28.0	-35.2	-16.2	-9.8	-1.2	-10.1	-7.0
All Countries **							
Average	-10.9	-15.7	-7.5	-5.9	-0.3	1.6	2.0
Median	-11.9	-11.0	-8.2	-1.8	1.5	3.1	3.3
Highest	-0.5	2.6	9.6	9.4	8.9	10.5	11.0
Lowest	-28.0	-52.3	-25.4	-31.2	-12.5	-10.1	-25.0

Sources: IMF data reported in Havrylyshyn, Izvorski and Van Rooden, (1998)

Table A-4: Consumer Price Inflation in Transition Economies, 1991-1997

(Annual Inflation Rate in Percent)	1991	1992	1993	1994	1995	1996	1997
Bulgaria	490.1	79.4	63.8	121.9	32.9	310.8	581.9
Central & Eastern Europe & Baltics*							
Average	134.8	495.7	224.7	56.3	23.2	24.2	11.5
Median	122.2	210.4	85.1	35.9	25.1	18.8	9.1
Highest	333.5	1,925.2	1,515.6	136.7	62.1	123.0	1,082.2
Lowest	34.8	10.1	20.8	10.2	2.0	2.3	2.9
All Countries **							
Average	115.1	741.8	1,071.1	1,311.8	178.1	87.0	72.6
Median	98.0	853.8	534.2	136.7	39.5	23.5	14.7
Highest	333.5	1,925.2	4,734.9	15,606.5	1,005.3	992.0	1,082.2
Lowest	34.8	10.1	20.8	10.2	2.0	2.3	2.9

Sources: IMF data reported in Havrylyshyn, Izvorski and Van Rooden (1998)

* Includes: Estonia, Latvia, Lithuania (Baltics), Albania, Bulgaria, Croatia, Czech Republic, Hungary, Macedonia, Poland, Romania, Slovakia, and Slovenia (Central and Eastern Europe)

** Includes Central and Eastern Europe and the Baltics, plus C.I.S. countries: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan

Table A-5: Broad Money * Growth in Transition Economies, 1991-1997

(Annual Growth Rate in Percent)	1991	1992	1993	1994	1995	1996	1997
Bulgaria	121.3	42.9	48.4	77.9	39.6	117.8	345.0
Central & Eastern Europe & Baltics							
Average	72.2	67.7	123.4	49.9	27.7	33.5	--
Median	69.1	62.7	62.0	41.1	29.8	21.3	--
Highest	121.3	123.6	560.8	138.1	71.6	124.3	--
Lowest	29.4	27.3	16.8	13.0	-24.0	-1.8	--
All Countries							
Average	72.2	366.9	765.6	424.2	94.0	46.9	--
Median	69.1	366.0	317.6	117.4	51.8	33.6	--
Highest	121.3	1,110.0	4,319.0	2,229.5	616.4	225.5	--
Lowest	29.4	27.3	16.8	13.0	-24.0	-1.8	--

Sources: IMF (1997); BNB monthly bulletins

Table A-6: Dollarization Ratio ** in Transition Economies, 1991-1997

(Dollarization Ratio in Percent)	1991	1992	1993	1994	1995	1996	1997
Bulgaria	36.6	24.2	19.0	31.3	26.3	48.2	40.6
Central & Eastern Europe & Baltics							
Average	23.2	25.3	24.4	24.1	24.2	25.8	--
Median	20.6	23.5	25.7	22.1	22.6	23.4	--
Highest	56.3	46.6	45.8	48.4	57.4	59.6	--
Lowest	1.3	6.3	4.6	7.2	6.4	7.6	--
All Countries							
Average	19.2	18.6	22.2	26.3	21.6	22.9	--
Median	16.5	17.9	20.2	22.5	20.4	19.0	--
Highest	56.3	46.6	45.8	58.9	57.4	59.6	--
Lowest	0.2	0.1	1.8	1.9	5.0	7.6	--

Sources: IMF (1997); BNB monthly bulletins

* Broad money includes currency outside banks, domestic currency deposits (demand, time and savings deposits), and foreign currency deposits in domestic banks.

** The dollarization ratio is the ratio of foreign currency deposits to broad money.

No data available for C.I.S. countries in 1991; data partially available for Central and Eastern Europe and the Baltics in that year.

Table A-7: Growth in Domestic Credit and Central Bank Refinancing, January 1996-March 1997, Lev Only

	Commercial Banks Claims on Government Budget	Commercial Banks Claims on Non-Government Sector	BNB Claims on Commercial Banks (Refinancing)	BNB Claims on Government Budget
Jan-96	5.3%	0.2%	1.6%	10.4%
Feb-96	2.5%	0.4%	29.5%	-3.9%
Mar-96	-1.2%	-0.4%	16.1%	6.4%
Apr-96	-1.5%	-1.2%	19.2%	-10.3%
May-96	1.2%	4.3%	29.5%	4.2%
Jun-96	0.4%	3.1%	16.6%	7.7%
Jul-96	13.5%	3.2%	9.7%	58.1%
Aug-96	-6.2%	4.6%	-5.2%	8.0%
Sep-96	1.2%	2.0%	14.4%	-7.2%
Oct-96	7.7%	0.0%	20.0%	-5.5%
Nov-96	19.2%	1.5%	8.5%	29.1%
Dec-96	5.9%	-2.8%	21.6%	33.3%
Jan-97	-6.5%	4.4%	0.4%	22.6%
Feb-97	39.9%	6.6%	2.5%	-5.0%
Mar-97	33.1%	-10.0%	7.8%	0.4%

All numbers are monthly growth rate

Source: BNB Data, <http://www.bnb.bg>

Table A-8: Growth in Domestic Credit and Central Bank Refinancing, January 1996-March 1997, Foreign Currency

	Commercial Banks Claims on Government Budget	Commercial Banks Claims on Non-Government Sector	BNB Claims on Commercial Banks (Refinancing)	BNB Claims on Government Budget
Jan-96	2.8%	9.8%	3.6%	--
Feb-96	5.2%	3.6%	-0.2%	--
Mar-96	1.1%	4.8%	7.5%	--
Apr-96	8.3%	13.9%	10.7%	--
May-96	7.5%	53.6%	57.0%	--
Jun-96	45.9%	3.8%	4.3%	--
Jul-96	15.4%	20.2%	19.2%	--
Aug-96	6.5%	7.3%	4.8%	--
Sep-96	11.1%	10.0%	10.6%	--
Oct-96	1.0%	3.4%	9.0%	18.8%
Nov-96	39.1%	39.6%	41.1%	100.0%
Dec-96	31.5%	33.0%	38.2%	83.4%
Jan-97	99.4%	100.3%	107.2%	97.6%
Feb-97	91.3%	96.6%	92.2%	112.3%
Mar-97	-29.9%	-29.2%	-22.9%	-20.4%

All numbers are monthly growth rate

Source: BNB Data, <http://www.bnb.bg>

Table A-9: General Government Budget, Cash Basis Reporting, 1991-96

In BGL Million	1991	1992	1993	1994	1995	1996
Revenue	55,923	39,585	55,140	133,112	197,294	349,979
Tax Revenue	51,390	30,878	41,013	102,308	160,108	287,279
Non-Tax Revenue	4,533	8,706	14,126	30,804	37,186	62,700
Non-interest Expenditure	52,226	38,341	60,357	96,481	131,292	196,889
Current Expenditures ¹	26,303	6,049	10,073	15,852	16,817	30,277
Capital Investment	2,658	97	385	693	837	1,693
Transfers	23,265	32,195	49,899	79,936	113,637	164,920
Primary Balance	3,697	1,243	-5,218	36,631	66,002	153,090
Interests on Internal Loans	8,154	9,687	24,677	64,112	99,287	296,482
Domestic Balance	-4,457	-8,443	-29,894	-27,482	-33,284	-143,392
Interests on External Loans	566	3,277	3,126	6,562	24,641	47,477
Cash Deficit	-5,024	-11,720	-33,020	-34,044	-57,925	-190,869
As Percentage of GDP	3.6%	6.0%	11.5%	6.5%	6.7%	11.5%
Foreign Financing	-2,040	-1,619	-3,666	-2,750	-11,713	-50,108
Domestic Financing	7,064	13,342	36,686	36,794	69,638	240,977
Operations in Government Securities	3,648	4,116	28,279	37,144	69,939	146,409
Issue of Securities in Current Year	--	8,141	33,423	65,484	124,705	251,779
Repayment of Securities ²	--	-4,025	-5,144	-28,341	-54,766	-105,370
Bank Financing	3,416	9,226	8,402	7,405	-4,486	111,536
Central Bank	--	10,277	10,528	7,878	-4,013	112,009
Other Financial Institutions	--	-1,052	-2,125	-473	-473	-473
Other Domestic Financing	--	0	5	-7,755	4,186	-16,968
Operations in Government Securities as Percentage of Total Domestic Financing	52%	31%	77%	101%	100%	61%

Cash Basis: accrued but unpaid interests on external loans are deducted

Notes: 1. Includes wages, salaries, spending on defense, security, maintenance and operations, etc.

2. Issued in previous years

Table A-10: Gross Foreign Debt and Indicators, 1991-96

	1991	1992	1993	1994	1995	1996
Gross Foreign Debt (\$ million)	12,301	13,858	13,889	11,411	10,229	9,655
Long-term debt	2,676	3,167	3,257	9,268	8,841	8,282
Short-term debt	9,625	10,691	10,633	2,143	1,388	1,374
Debt Indicators (%)						
Short-term / Total debt	78.2	77.1	76.6	18.8	13.6	14.2
Gross foreign debt / GDP	161.9	161.1	131.0	118.9	78.7	99.1
Short-term debt / GDP	126.6	124.3	100.3	22.3	10.7	14.1
Gross foreign debt / Exports ¹	297.4	275.7	283.6	219.8	151.0	158.8
Foreign debt service / GDP ²	3.2	5.1	4.0	15.1	7.3	10.8
Foreign debt service / Exports	5.8	8.8	8.7	27.9	13.9	17.2

Notes: 1. Exports of goods and services

2. Principal and interest repayments

Table A-11: Bulgaria's Balance of Payments, 1991-96

In \$ Million	1991	1992	1993	1994	1995	1996
Goods, net	-32	-212	-885	-17	121	208
Exports	3,737	3,956	3,727	3,935	5,345	4,881
Imports	3,769	4,169	4,612	3,952	5,224	4,673
Services, net	-86	-95	-57	11	153	124
Exports	400	1,070	1,172	1,257	1,432	1,365
Imports	486	1,165	1,229	1,246	1,278	1,242
Income, net ¹	-28	-96	-192	-193	-432	-395
Balance on goods, services and income	-146	-403	-1,135	-198	-158	-64
Current Transfers, net	69	43	37	174	132	104
Balance on Current Account	-77	-361	-1,098	-25	-26	41
Capital Transfers, net	0	0	0	0	0	66
Direct Investment	56	42	55	105	98	140
Portfolio Investment	0	0	0	-10	-66	-169
Other Investment	353	1,045	775	200	87	-695
Assets	--	--	--	--	404	-652
Of which, change in short-term capital ²	-284	454	460	8	-232	-1,007
Of which, change in FX Deposits	--	--	--	-299	171	--
Liabilities	--	--	--	--	-317	-43
Of which, loans from monetary authorities ³	386	217	44	264	-240	-108
Capital Account Balance	409	1,087	831	296	120	-658
BNB Reserves ⁴	-311	-591	247	-351	-234	751
Monetary Gold	0	0	0	-4	0	0
Special Drawing Rights	-8	8	-1	-14	-15	18
Reserve Position in the Fund	0	-53	8	-3	0	0
Foreign Exchange Reserves	-302	-546	239	-334	-219	733
Errors and Omissions	-21	-135	21	80	139	-134

Notes: 1. 1992-94: cash basis, 1995-97: due basis

2. Resident capital outflow (withdrawal of cash from foreign currency deposits), plus capital outflow abroad

3. Including the IMF, net

4. Minus indicates an increase

Table A-12: Domestic Bad Debt Government Bonds, BGL Billion

Normative Act	Date of Issue	Debt as of Date of Issue	Debt as of Dec. 1995	Debt as of Dec. 1996	Maturity
CM Decree No. 244 of 1991	Jan-92	4.1	4.1	4.1	20 years
CM Decree No. 234 of 1992	Jul-93	6.2	4.8	4.8	20 years
LSNC of 1993: ¹					
Lev-denominated ZUNK bonds	Oct-93	26.3	22.6	20.1	25 years
Dollar-denominated ZUNK bonds ²	Jan-94	97.0	68.7	463.1	25 years
CM Decree No. 3 of 1994	Dec-93	2.0	1.7	1.4	25 years
CM Decree No. 89 of 1995: ³					
Bond Issue No. 200	May-95	22.1	22.1	22.1	7 years
Bond Issue No. 201	May-95	36.3	36.3	36.3	7 years
Bond Issue No. 202	May-95	1.2	1.2	1.2	5 years
Bond Issue No. 203	May-95	1.0	1.0	1.0	3 years
Total Outstanding Debt		196.2	162.4	554.0	

Notes: 1. Law on Settlement of Non-performing Credits

2. At "current" exchange rate: date of issue, December 1995, and December 1996

3. Measures for the rehabilitation of Economic (Stopanska) Bank and Mineral Bank

Source: Dimitrova (1996), page 2; BNB, Annual Report 1996

Table A-13: Structure of Domestic Government Debt

Debt Components	Dec. 1994		Dec. 1995		Dec. 1996	
	Value	%	Value	%	Value	%
Bad Debt Bonds	156.6	57%	162.4	47%	554.0	53%
Bonds for State Protection of Deposits ¹	0.0	0%	0.0	0%	58.0	6%
Bonds for Deficit Financing	74.8	27%	154.8	45%	301.1	29%
Direct Debt to Financial Institutions	42.3	15%	27.8	8%	139.3	13%
To the BNB	40.1	15%	26.1	8%	138.1	13%
To Other Financial Institutions ²	2.2	1%	1.7	1%	1.3	0%
Total Debt	273.7	100%	345.0	100%	1,052.5	100%

Source: OECD (1997) page 56 and BNB, Annual Report 1996

1. Under the Law on State Protection of Deposits and Accounts with Commercial Banks in respect whereof the BNB Has Petitioned the Institution of Bankruptcy Proceedings.

2. State Savings Bank and State Insurance Institute

Table A-14: Non-performing Loans (in Percent of Banks' Loan Portfolio) and *Reported* Liquidity Crises in a Sample of Transition Economies, 1990-1997

	1990	1991	1992	1993	1994	1995	1996	1997
Central & Eastern Europe								
Bulgaria	54	--	--	--	7	13 *	15 *	13 *
Czech Republic	--	2	19	23	37	33	30 *	27 *
Hungary	--	--	--	29	28	20	12	8 *
Macedonia	--	--	--	80 *	-- *	44	--	36
Poland	--	16	30	29	28	21	13	10
Baltics								
Estonia	--	--	--	7	3 *	3	2	1
Latvia	--	--	--	5	10	19 *	20	10
Lithuania	--	--	--	--	27	17 *	32 *	28
CIS								
Georgia	--	--	--	--	24	41 *	7 *	7 *
Kazakhstan	--	--	--	--	--	33	41 *	25
Kyrgyz Republic	--	--	--	--	92	72	26	8
Ukraine	--	--	--	--	5	13	12	11

Sources: EBRD Transition Report (1998); International Monetary Fund; Central Banks. Reported in Tang, Zoli, and Klytchnikova (2001), pp. 7-10; asterisks added by the author.

Table A-15: Fiscal and Quasi Fiscal Costs of Banking Crises in a Sample of Transition Economies, *Percent of GDP*

	Cost of Bank Restructuring to Government	Cost of Bank Restructuring to Central Bank	Cost of Depositor Compensation to Government	Total Costs
Central & Eastern Europe				
Bulgaria	26.5	11.8	3.3	41.6
Czech Republic	20.6	4.8	--	25.4
Hungary	12.9	0.0	--	12.9
Macedonia	5.1	0.7	24.5	30.3
Poland	6.9	0.5	0.01	7.4
Baltics				
Estonia	1.1	0.8	--	1.9
Latvia	2.5	0.1	0.04	2.7
Lithuania	1.7	0.2	1.3	3.1
CIS				
Georgia	0.1	--	--	0.1
Kazakhstan	18.4	--	--	18.4
Kyrgyz Republic	4.4	8.9	0.5	10.6
Ukraine	0.0	--	--	--

Source: Tang, Zoli, and Klytchnikova (2001), pp. 22-23, 28-29, 34, and 35. Cost estimates reported in this table are total costs over 1991-1998, as a percentage of GDP. Totals may not add up due to rounding errors.

Table A-16: Fiscal Expenditures due to Banking Crises and Fiscal Deficit in a Sample of Transition Economies, *Percent of GDP*, 1991-1997

	1991	1992	1993	1994	1995	1996	1997
Bulgaria	0.0 4.5	1.3 4.9	1.3 12.1	2.9 4.6	2.9 * 5.2	12.1 * 15.4	1.0 * (2.1)
Hungary	0.0 3.8	0.1 7.8	0.0 9.2	1.2 8.6	1.9 6.2	1.5 3.1	1.2 * 4.8
Macedonia	0.0 --	0.0 8.7	0.0 * 12.1	0.0 * 2.9	0.4 0.7	0.4 0.3	0.4 0.4
Poland	0.3 3.6	0.4 6.1	0.5 3.1	0.7 3.3	0.6 3.3	0.4 3.4	0.3 2.7
Estonia	0.0 (5.0)	0.0 0.2	0.2 0.7	0.1 * (1.4)	0.1 1.3	0.5 1.9	0.1 (2.2)
Latvia	0.0 --	0.0 0.8	0.3 (0.6)	0.4 4.0	0.1 * 3.5	0.0 1.8	0.0 (0.3)
Lithuania	0.0 (2.6)	0.0 (0.5)	0.0 3.3	0.0 5.5	0.0 * 4.5	0.4 * 4.5	0.2 1.8
Kyrgyz Republic	0.0 (4.6)	0.0 17.4	0.0 14.4	0.0 11.6	0.0 17.3	0.2 9.5	0.6 9.0

For each country, fiscal expenditures are shown in the first row, general government deficit (surplus) in the second row. *Reproduced from Tang, Zoli, and Klytchnikova (2001), page 37. Asterisks signal the occurrence of liquidity problems in the banking sector.*

APPENDIX B: Unit Root Tests

Table A-17: Augmented Dickey-Fuller Tests (No Intercept, No Trend, No Break)

Variable	In Levels		First Difference	
	ADF	Outcome	ADF	Outcome
Real M1	-0.82678	Cannot Reject H_0	-5.44652	***
Real M2	-1.25093	Cannot Reject H_0	-5.05398	***
Real M2 (Lev Component)	-1.49505	Cannot Reject H_0	-7.67905	***
M2 (Foreign Component)	-0.44185	Cannot Reject H_0	-5.15123	***
CPI	1.01441	Cannot Reject H_0	-4.45540	***
Exchange Rate	0.44616	Cannot Reject H_0	-5.84545	***
Basic Interest Rate	-1.40984	Cannot Reject H_0	-6.16418	***
Monthly Deposit Rate	-1.27526	Cannot Reject H_0	-6.14020	***
Industrial Production	-1.24021	Cannot Reject H_0	-7.43085	***

All real monetary aggregates in log

Sample period: January 1993-December 1997

*, ** and *** denote significant at the 10%, 5%, and 1% levels, respectively.

Table A-18: Augmented Dickey-Fuller Tests (Intercept, No Trend, No Break)

Variable	In Levels		First Difference	
	ADF	Outcome	ADF	Outcome
Real M1	-2.07473	Cannot Reject H ₀	-5.45473	***
Real M2	-0.68147	Cannot Reject H ₀	-5.26142	***
Real M2 (Lev Component)	-1.10218	Cannot Reject H ₀	-5.13191	***
M2 (Foreign Component)	-0.94944	Cannot Reject H ₀	-5.08923	***
CPI	0.44321	Cannot Reject H ₀	-4.71232	***
Exchange Rate	-0.26230	Cannot Reject H ₀	-6.32349	***
Basic Interest Rate	-2.13594	Cannot Reject H ₀	-6.11386	***
Monthly Deposit Rate	-2.13455	Cannot Reject H ₀	-6.09973	***
Industrial Production	-4.87591	***	-7.42382	***

All real monetary aggregates in log

Sample period: January 1993-December 1997

*, ** and *** denote significant at the 10%, 5%, and 1% levels, respectively.

Table A-19: Augmented Dickey-Fuller Tests (Intercept, Trend, No Break)

Variable	In Levels		First Difference	
	ADF	Outcome	ADF	Outcome
Real M1	-2.36319	Cannot Reject H_0	-5.53145	***
Real M2	-2.06710	Cannot Reject H_0	-5.25043	***
Real M2 (Lev Component)	-2.11145	Cannot Reject H_0	-5.06415	***
M2 (Foreign Component)	-1.26533	Cannot Reject H_0	-5.06897	***
CPI	-0.94645	Cannot Reject H_0	-5.12251	***
Exchange Rate	-1.56872	Cannot Reject H_0	-6.48515	***
Basic Interest Rate	-2.01203	Cannot Reject H_0	-6.12984	***
Monthly Deposit Rate	-2.11594	Cannot Reject H_0	-6.12528	***
Industrial Production	-5.16985	***	-7.34577	***

All real monetary aggregates in log

Sample period: January 1993-December 1997

*, ** and *** denote significant at the 10%, 5%, and 1% levels, respectively.

APPENDIX C: The Bulgarian Banking System, 1987-1997

Table A-20: The Bulgarian Banking System, 1987-1997

Period	Banking Sector Developments
Before 1987	Three banks: Bulgarian Bank of Foreign Trade (foreign exchange operations), State Saving Bank (household deposits, housing loans), and Bulgarian National Bank (currency issuance, commercial and investment banking)
1987 – 1990	Introduction of two-tier banking system: one central bank (BNB), 7 specialized banks, and 59 small (state-owned) commercial banks
1991	First private banks licensed
1992	Government set up Bank Consolidation Company (BCC) to merge, strengthen, and supervise state-owned banks for privatization. By the end of 1995: 10 state banks, 29 private banks, 6 foreign banks.
1994	Introduction of ZUNK bond program to recapitalize insolvent banks. Limited impact on banks' long-term viability due to severe design flaws (e.g., yield below market rate).
1994-1995	Increasing solvency and liquidity problems. Heavy refinancing of illiquid institutions by BNB and SSB.
November 1995 – December 1995	Interdepartmental committee (BNB-BCC) established. Substantial provisioning and disclosure requirements imposed upon banks. Large number of banks (state-owned and private) found “technically bankrupt.” Limited BNB actions. Why? Absence of bankruptcy laws and fear of disrupting payments system (stronger banks were too small and too specialized). Plans to introduce limited deposit insurance announced in December.
December 1995 – April 1996	Public awareness of the crisis: lines outside banks and serious liquidity shortages (especially in foreign currency). Widespread rumors of bank failures. Overall: rapid loss of deposits and financial disintermediation. BNB injected BGL 25 billion (16 percent of reserve money); SSB increased inter-bank lending by BGL 12 billion (8 percent of reserve money).

Source: Enoch, Gulde and Hardy (2002)

Table A-20 Continued

Period	Banking Sector Developments
May 1996	<p>Widespread deposit runs. New legislation passed to allow bank closures. Two large banks closed (First Private Bank and Mineralbank), along with three smaller banks.</p> <p>Limited demonstration by depositors: domestic currency deposits available at SSB after two weeks; foreign currency deposits transferred to Postbank, to be paid in four installments over two-year period, or immediately in Lev.</p> <p>Severe lending restrictions placed on remaining weaker banks (through memoranda of understanding with BNB). Limitations on BNB unsecured refinancing, and commitments to enhance supervisory standards under program sponsored by IMF.</p>
May 1996 – July 1996	<p>Stabilization of deposits through July 96. Significant reduction in pressures on BNB and SSB. Some problems remained:</p> <ul style="list-style-type: none"> - Closure decisions repeatedly postponed: BNB assessment of banks' financial condition contested in Courts; - Limited ability of government to handle crisis more comprehensively (e.g., through massive bank recapitalization) and loss of credibility.
July 1996 – Early September 1996	<p>Provision of substantial liquidity by BNB, without equivalent sterilization.</p> <p>Many undercapitalized banks still in operation: negative cash flow, mounting uncollected interests, further decline in quality of banks portfolio. Widespread disintermediation: significant outflows of domestic and foreign currency deposits from almost all banks. Resurgence of lines outside banks and liquidity shortages.</p> <p>Banking crisis “<i>spilled over into public debt market:</i>” decline in banks participation in government paper market (preference for domestic and foreign cash).</p> <p>Significant delays in payments system: contagion to stronger banks. By early September, public expected new wave of bank closures.</p>
Late September 1996 - October 1996	<p>Comprehensive and wide-ranging restructuring of banking sector.</p> <ul style="list-style-type: none"> - Nine banks under conservatorship on September 23, 1996. Significant increase in basic interest rate. Deposit insurance payments deferred until banks declared bankrupt by Courts. - October: two stronger banks subject to runs, following rumors of account shifting by Customs Services. \$23 million worth of foreign currency deposits withdrawn (1 percent of reserve money). - To restore confidence in remaining banks: huge liquidity injections by BNB (Lombard window first; purchase of ZUNK bonds later). Why? Announcement that second wave of bank closures was “final” to restore confidence.
November 1996	<p>No insolvent banks in the system (one state bank extremely vulnerable). End of interventions: inflationary pressures, emerging political crisis, debate about currency board.</p> <p>Stabilization of banking system: exchange rate revaluation gains, high domestic</p>

Period	Banking Sector Developments
	interest rates, increased banking activity due to “flight to quality.”
December 1996 – February 1997	<p>Hyperinflation eroded liabilities of banking system and made currency board feasible.</p> <p>New government and restored confidence: increase in market value of state bonds and rapid improvement of banks’ balance sheets.</p>

Source: Enoch, Gulde and Hardy (2002)

APPENDIX D: Some Stylized Facts

The purpose of this Appendix is to highlight key events and developments in Bulgaria's financial crisis. Summary charts used in the discussion are provided in Appendix E.

The Bulgarian Business Cycle

In the early part of the nineties, the Bulgarian economy went through periods of relative calm followed by episodes of turbulence, or extreme turbulence. This is illustrated by the daily depreciation rate of the Lev, in Figure A-1 in Appendix E. Three regimes can be identified: calm (1992-93, and mid-94 to mid-95), turbulence (early-94 and 1996), and extreme turbulence (1997).²⁰⁶ The regime *shifts* appear to have coincided with changes in the interest rate on domestic money and/or expected changes in the level of foreign exchange reserves associated with either large forthcoming foreign debt payments, or a deterioration of the country's relationships with the IMF and the World Bank, jeopardizing the inflow of foreign capital. During periods of calm, real money holding was relatively stable, implying that money balances and the price level grew approximately at the same rate. The exchange rate was also stable, sometimes even more so than the price level, leading to a real appreciation of the Lev. During periods of turbulence, the exchange rate and the price level *both* jumped abruptly (after depletion of the foreign exchange reserves), while

²⁰⁶ See in particular Wyzan (1998) in the literature review

real money holding faltered. Turbulence episodes were also preceded by, or associated with, large increases in the financing requirements of the government budget; fiscal deficits exceeded ten percent of GDP in both 1993 and 1996.

Real Sector Losses and Monetary Instability

Given the relationships between the government budget, the central bank, the banking system, and the public and private enterprise sectors highlighted in the paper, the financial crisis in Bulgaria could be *interpreted* as the collapse of a statewide pyramid scheme. This is explained below.

The banking system initially served as a simple “interface” between households and state owned companies: households held domestic currency in bank deposits; commercial banks invested the proceeds of these deposits into state firms. The decapitalization of state firms (through various forms of *asset stripping*) produced a fall in output, leading to financial losses. These losses were transferred to commercial banks through interest payment arrears and default on loan repayments. They were eventually fiscalized through the conversion of commercial banks’ bad loans into government debt (the ZUNK bond program). The inflationary pressures associated with servicing the government debt were initially contained by relatively high nominal interest rates on money, and a stable exchange rate, both leading to stable money demand. As structural reforms were delayed and decapitalization intensified, commercial banks continued to experience difficulties. They were kept afloat by repeated liquidity injections (central bank refinancing), and by further measures to transfer the bad loans burden into the government’s hands. As inflationary pressures intensified, the central bank had to increase interest rates to sustain money demand. This increase had a perverse effect on both the banking system and the

government budget. At some point, the servicing of government debt itself necessitated liquidity injections by the central bank (either through direct central bank credits, or through large loans to commercial banks investing the loan proceeds into government debt).

In a sense, the government as a whole (government plus central bank) was engaged in a “Ponzi Game” through i) the failure to pass structural reforms and adopt strict bankruptcy laws; ii) the continued support of ailing banks and accumulation of domestic debt to absorb and conceal real losses; and iii) increases in nominal interest rates to help support money demand. Within this partial framework, the crisis arose from the simple failure to recognize, and eliminate, financial losses early.

Budget Deficit Financing

The consolidated government had four options to finance its deficit: the use of foreign funds (received from international financial institutions or commercial banks), privatization proceeds, the issue of government securities, or money printing (seignorage). For Bulgaria, only two of these options were available during the crisis years: government debt and money printing. The third option (debt financing) necessitated a relatively healthy banking system, as commercial banks were the primary holders of Treasury bonds. The fourth option (money printing) also necessitated a stable banking system (and high nominal interest rates on Lev deposits) to support money demand and limit the inflationary pressures associated with the policy.²⁰⁷ Both options became rapidly unsustainable as confidence in the banking system crumbled.

²⁰⁷ As in Calvo and Végh (1995); see Appendix F

Foreign Exchange Reserves and Stabilization

As shown in Figure A-2, between January 1993 and December 1997, inflation accelerated whenever the foreign exchange reserves of the BNB fell below \$600 million. After the depletion of reserves, the inflation rate *significantly* exceeded the rate of growth of broad money, leading to a rapid reduction of real money balances. Through the period, nominal money growth exceeded inflation (implying remonetization of the economy) in only two occasions: from January through August 1995, and after March 1997. In *both* instances, the economy had gone through a severe demonetization associated with accelerating inflation in the preceding months.

Ignoring foreign debt payments and foreign financing, changes in foreign exchange reserves are an indicator of foreign exchange market pressures (under a fixed or managed exchange rate regime). As can be seen on the chart, monetary instability surfaced in the summer of 1993 (July), leading to the currency crash of March 1994, and in late 1995 (November) leading to the collapse of May 1996. In both cases, however, there were no signs of *accelerating* tensions (faster loss of reserves) as foreign exchange reserves approached the \$600 million threshold. This weakens the hypothesized link between foreign exchange reserves and households' expectations, and provides little evidence for a so-called "speculative attack" on BNB's reserves.²⁰⁸

²⁰⁸ Agénor, Bhandari and Flood (1992) for example, note that in a stochastic setting (where agents are only imperfectly informed about central bank policies), reserve depletion should *accelerate* on the way to the regime change (page 370). With perfect foresight, on the other hand, the path of reserve losses would follow that observed in Bulgaria!

Foreign Currency Deposits and Money Balances

The U.S. dollar value of broad money, broken down into its main components (currency in circulation, Lev deposits and foreign currency deposits) is shown in Figure A-3. Lev money in dollar terms (at market exchange rate) declined *rapidly* after November 1995. By the end of 1996, foreign currency deposits represented about half of broad money, and nearly two-third (65 percent) by the end of January 1997. As shown in the chart, in spite of the banking crisis, domestic currency in circulation (and the ratio of Lev currency to Lev deposits) did not increase that much through 1996, since a large portion of withdrawn bank deposits were converted directly into foreign cash.

As can be seen in Figure A-4, *both* foreign currency deposits (in U.S. dollars) and real Lev deposits started to fall in late 1995. This suggests that the instability in money demand (Lev) was due *primarily* to the banking crisis and not, in particular, to interest rate differentials between Lev and foreign currency deposits. The difference with the early 1994 currency crisis is striking, as foreign currency deposits grew continuously through most of 1994. In 1996, the run on commercial banks was associated with a run on the domestic currency (a flight from the Lev) because foreign cash provided the only “safe” hedge against inflation. In this line of thoughts, banking crises end up in a currency crisis, whenever holders of domestic currency expect an acceleration of inflation. Bulgarians expected a boot of inflation precisely at that time for various reasons, including i) poor economic performances through the year and cost-push inflation; ii) large banking sector liabilities, and lack of non-inflationary sources of budget deficit financing; and iii) pressures on the exchange rate, given the level of foreign exchange reserves and forthcoming foreign debt payments.

Refinancing, Domestic Credit and Money Growth

As shown in Figure A-6, BNB refinancing increased steadily from January 1994 through December 1996 (with few interruptions highlighted in Chapter 3). In 1996, most of the loans extended by the BNB were used by distressed commercial banks to service their obligations towards depositors (as deposit withdrawals intensified), and fueled the attack on the Lev. The rapid growth of domestic credit (in Lev) in July 1996 and between November 1996 and January 1997 resulted from large BNB credits to the government budget during these months. Nominal growth of broad money is shown in Figure A-7. A significant portion of nominal money growth in mid-to late 1996 was due to the depreciation of the Lev and the valuation of foreign currency deposits.

Change in Interest Rates and Foreign Exchange Market Instability

The *annual* basic interest rate and foreign exchange reserves of the BNB, and the *monthly* depreciation rate of the Lev are depicted in Figure A-8. The emergence of foreign exchange pressures in the summer of 1993 coincided with reductions in the basic interest rate, leading to *ex-post* interest rate differentials favoring foreign currency deposits through most of 1994. The repeated increases in the basic interest rate through 1994 did *not* help restore the confidence in the Lev, as foreign exchange reserves remained low and foreign currency deposits increased steadily, resulting in a minor currency crash in August-October 1994.

Reductions in the basic interest rate in the summer of 1995 were also accompanied by *limited* tensions in the foreign exchange market in the early fall

(although the reduction in reserves between June and October 1995 shown in the graph, is *not* due to interventions by the BNB). The rapid depletion of foreign exchange reserves after November occurred three months after the change in interest rate and, again, appears to have been precipitated primarily by problems in the banking sector. Increases in the basic interest rate after January 1996, when foreign exchange reserves were low and the banking crisis in full swing, were totally ineffective in stabilizing the foreign exchange market (although it is hard to say what would have happened without them!), with the exception of the large increase of September 1996, which again came with a series of other restrictive measures.

The February 1997 Near-Hyperinflation

The rapid depreciation of the Lev and the acceleration of inflation in late 1996 are fairly well understood; the dramatic plunge of the Lev and associated price increase of February 1997 are not. There was clearly overshooting, a panic among holders of domestic money at that time: i) the Lev appreciated *immediately* after the trough of mid-February, bringing the exchange rate from BGL 2,936.7 for one US dollar on February 12th, to BGL 2,045.5 at the end of the month; ii) the worst of the currency crash occurred precisely at the peak of the political crisis (although determining exactly when that peak was is highly subjective); and iii) the peak exchange rate was about twice the post-currency board “equilibrium” exchange rate (BGL1,000 for one Deutsch Mark; about BGL 1,700 for one US dollar).²⁰⁹

²⁰⁹ The currency-board equilibrium exchange rate should be calculated in relation to the level of foreign exchange reserves. Still, Balyozov (1999) estimated that, in February 1997, the Lev was about 60 percent undervalued, relative to its equilibrium.

APPENDIX E: Summary Charts

Figure A-1: Daily Depreciation of the Lev with respect to the U.S. Dollar, January 1991-March 1997

Figure A-2: BNB Foreign Exchange Reserves, Growth in Broad Money and Consumer Price Inflation, March 1993 – December 1997

Figure A-3: US Dollar Value of Broad Money, January 1993 – December 1997

Figure A-4: Foreign Currency Deposits and Real Lev Money, January 1993 - December 1997

Figure A-5: Time Deposits to Total Lev Deposits, Currency Deposit Ratio and Foreign Currency Deposits, January 1993 - December 1997

Figure A-6: Growth in Domestic Credit and Central Bank Refinancing, Lev Component, January 1993 – December 1997

Figure A-7: Growth in Broad Money, January 1993 – December 1997

Figure A-8: Basic Interest Rate and Foreign Exchange Market Turbulence, January 1993 – December 1997

Figure A-9: Index of Foreign Exchange Market Turbulence, January 1993 – December 1997

Figure A-1: Daily Depreciation of the Lev with respect to the U.S. Dollar, January 1991-March 1997

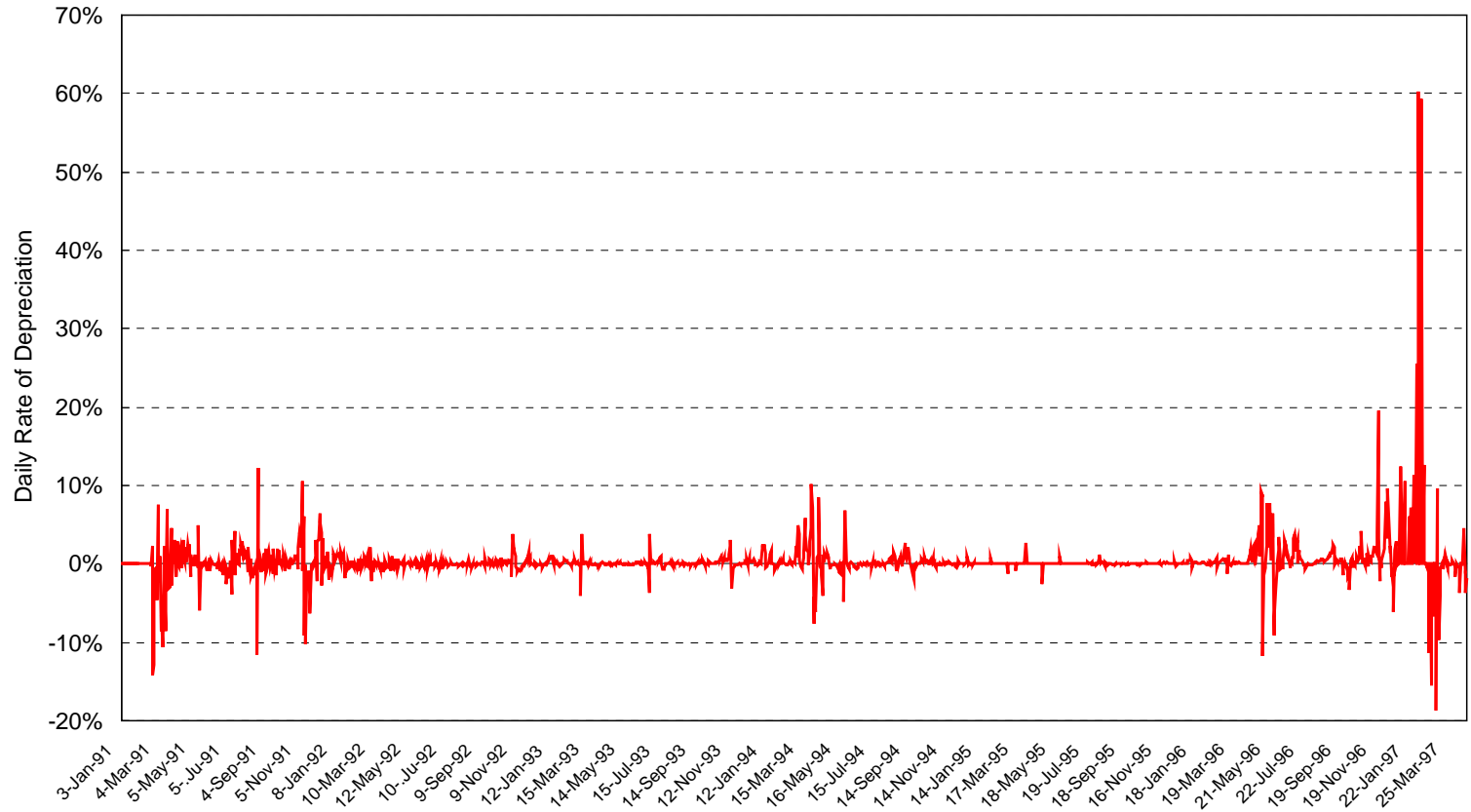


Figure A-2: BNB Foreign Exchange Reserves, Growth in Lev Money and Consumer Price Inflation, March 1993 – December 1997

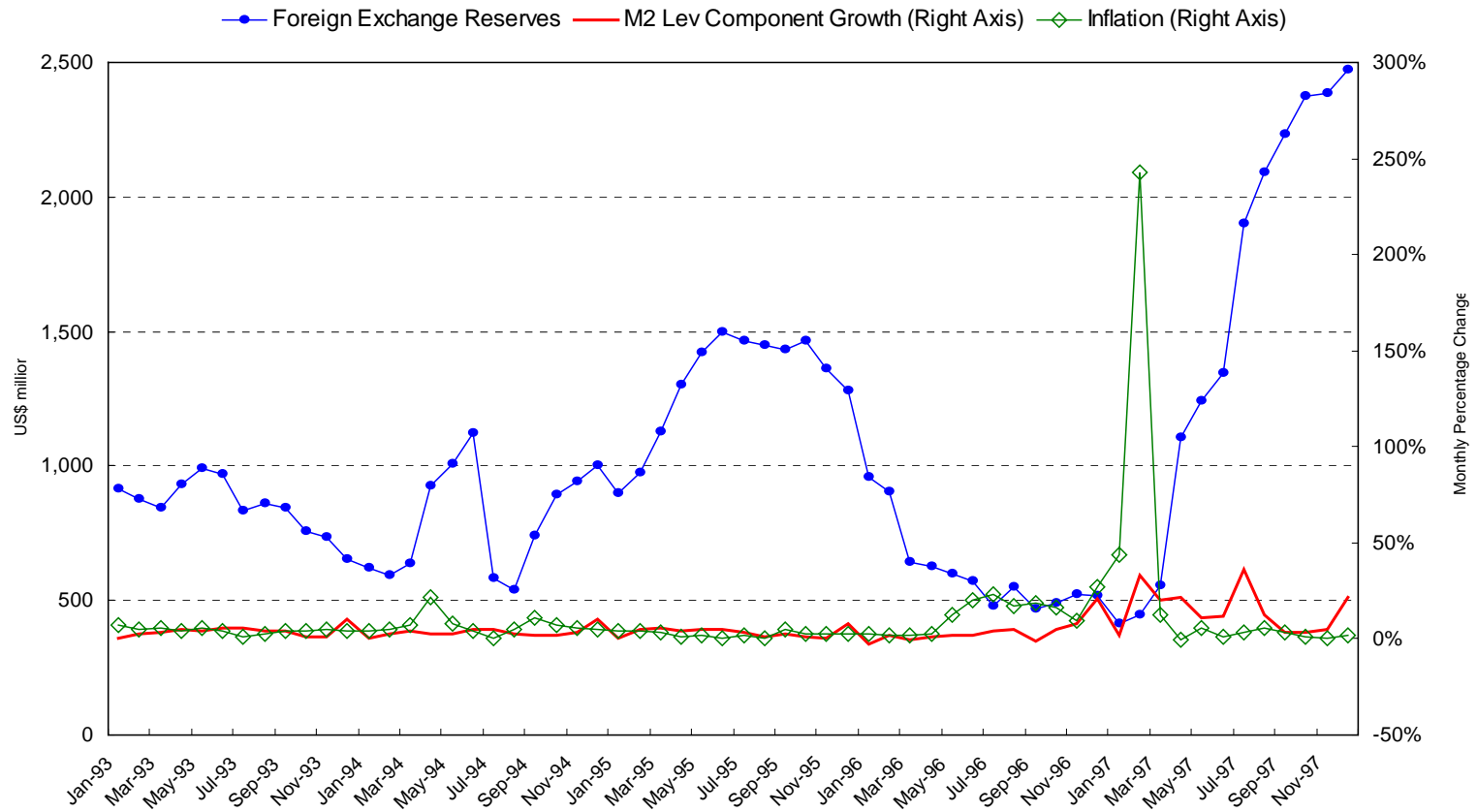


Figure A-3: US Dollar Value of Broad Money, January 1993 – December 1997

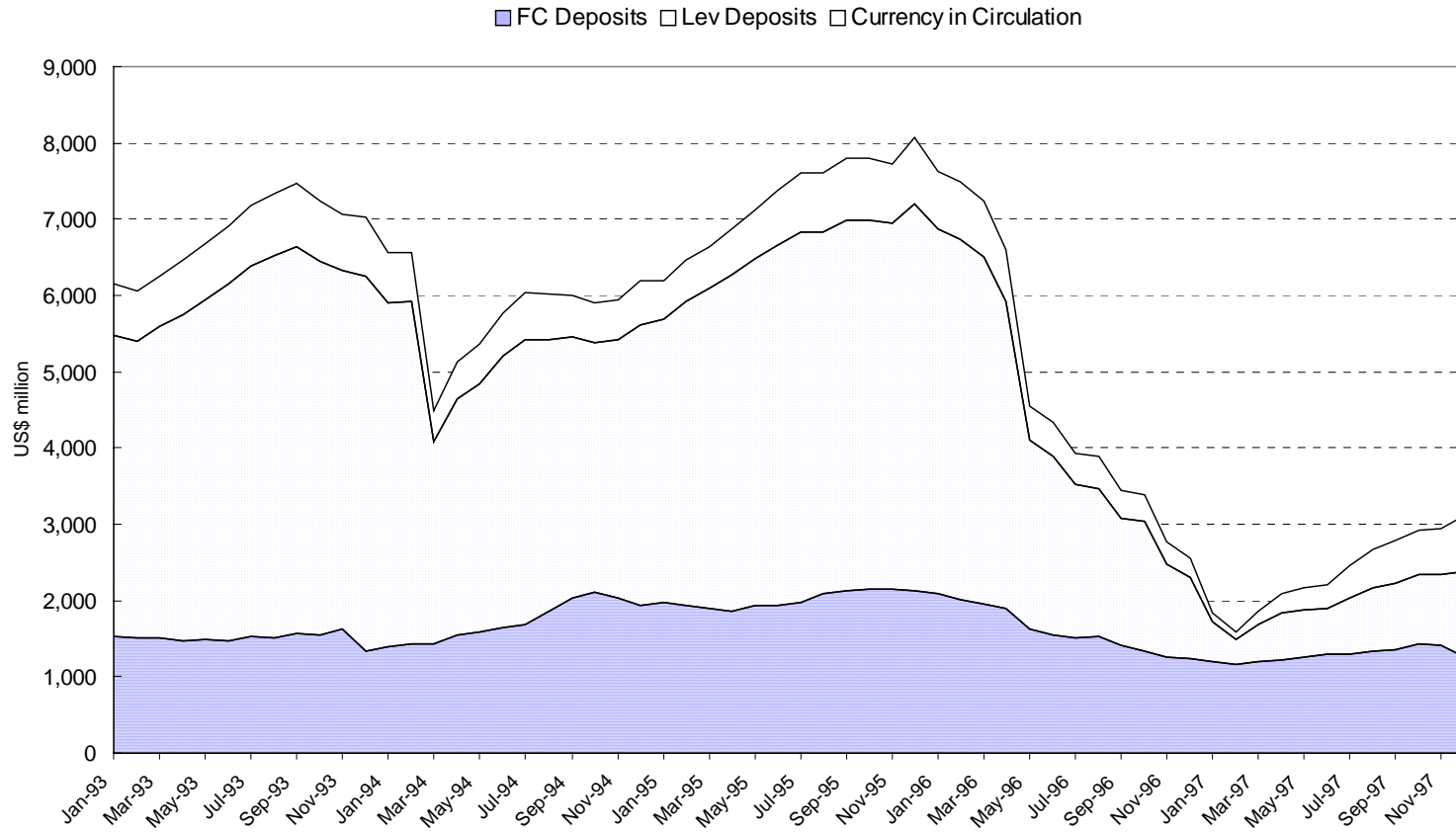


Figure A-4: Foreign Currency Deposits and Real Lev Money, January 1993 - December 1997

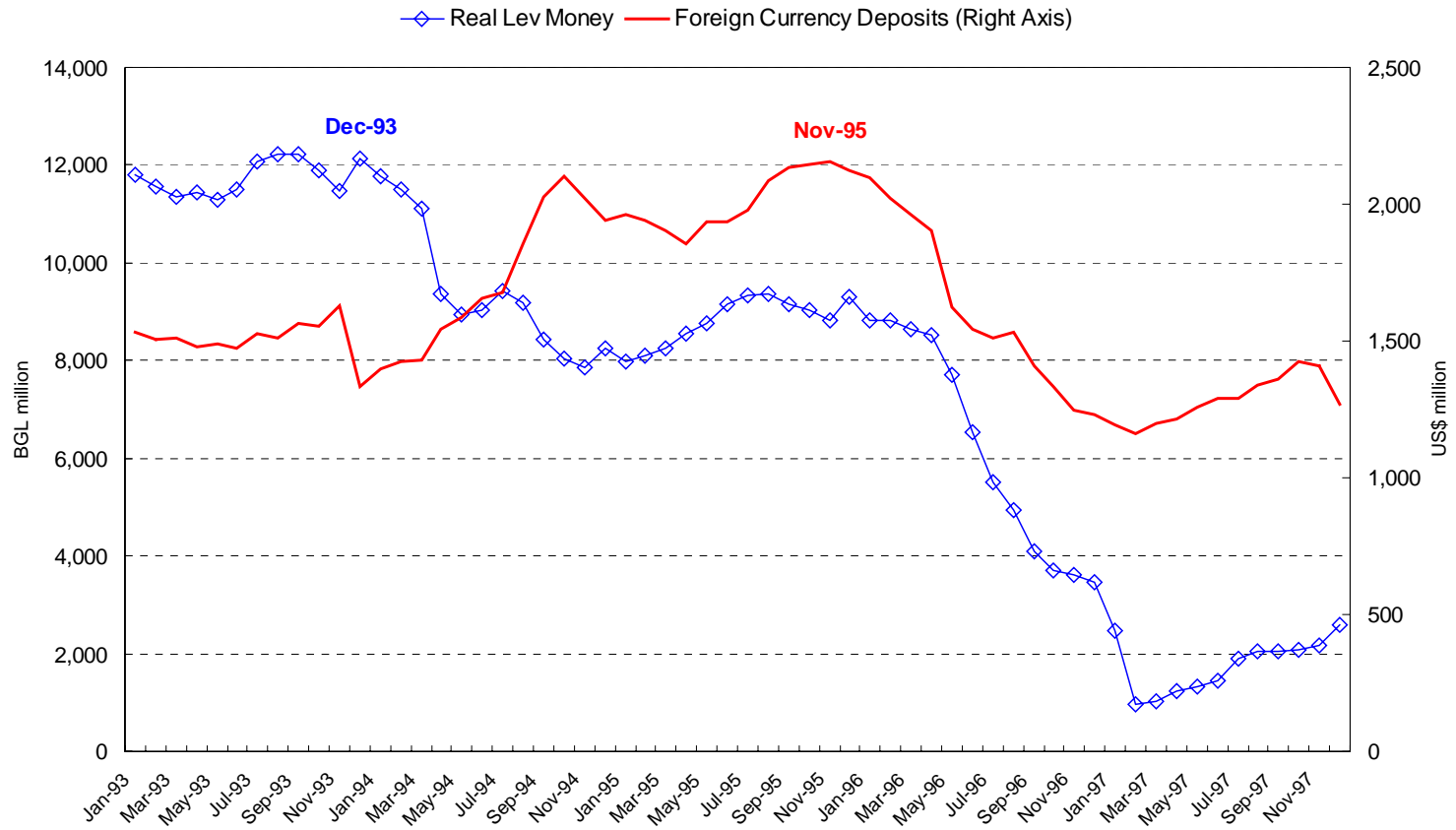


Figure A-5: Time Deposits, Currency Deposit Ratio and Foreign Currency Deposits, January 1993 - December 1997

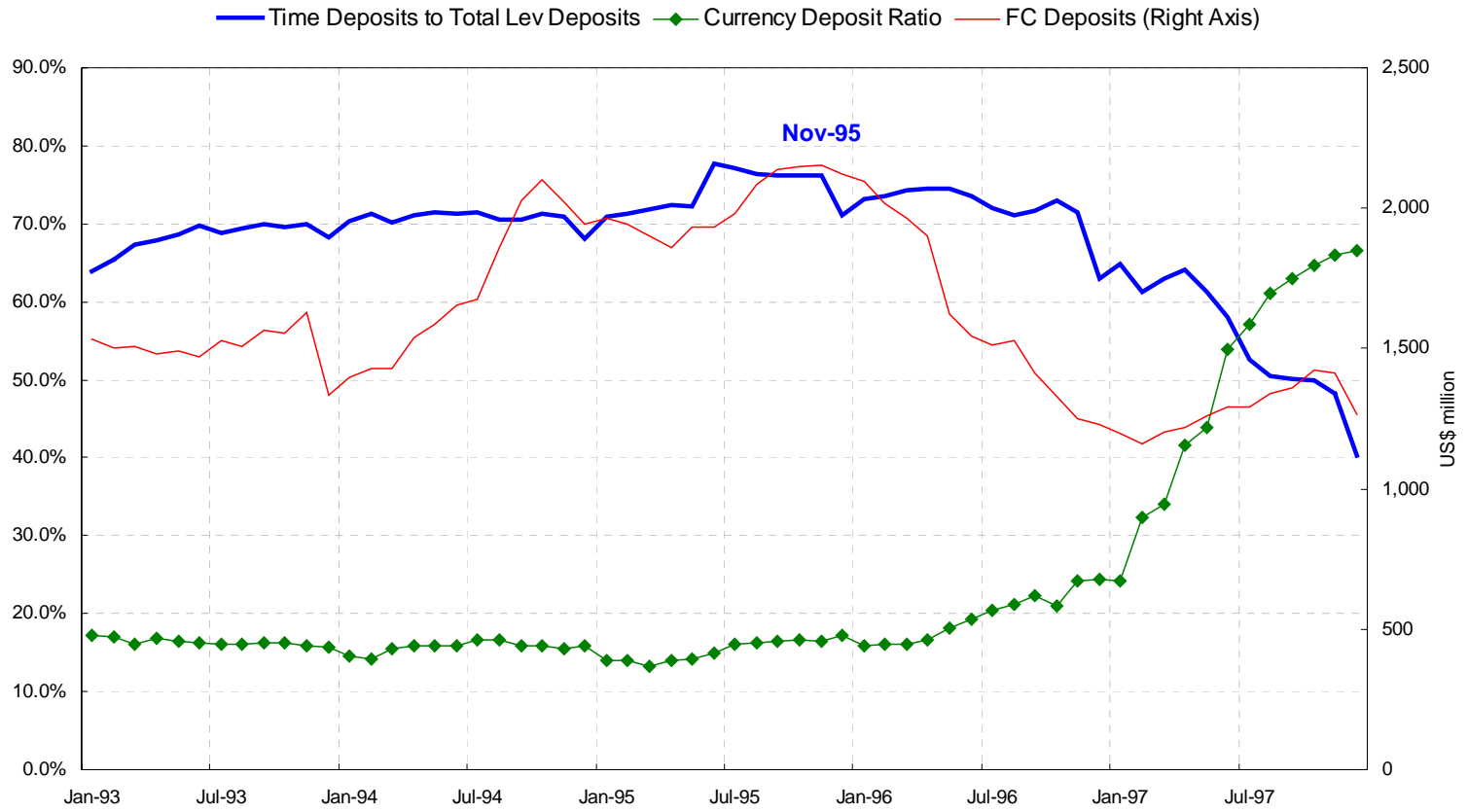


Figure A-6: Growth in Domestic Credit and Central Bank Refinancing, Lev Component, January 1993 – December 1997

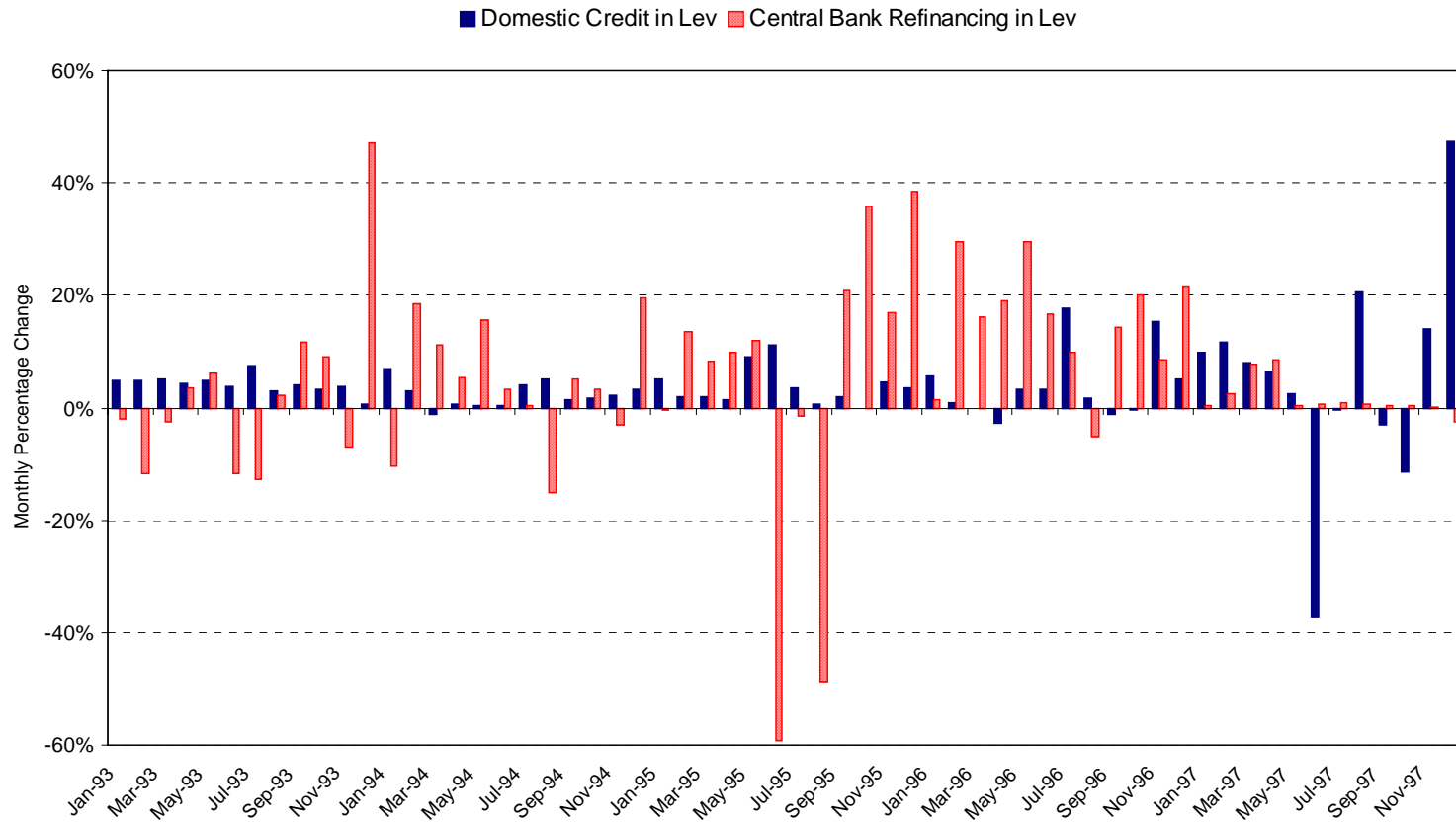


Figure A-7: Growth in Broad Money, January 1993-December 1997

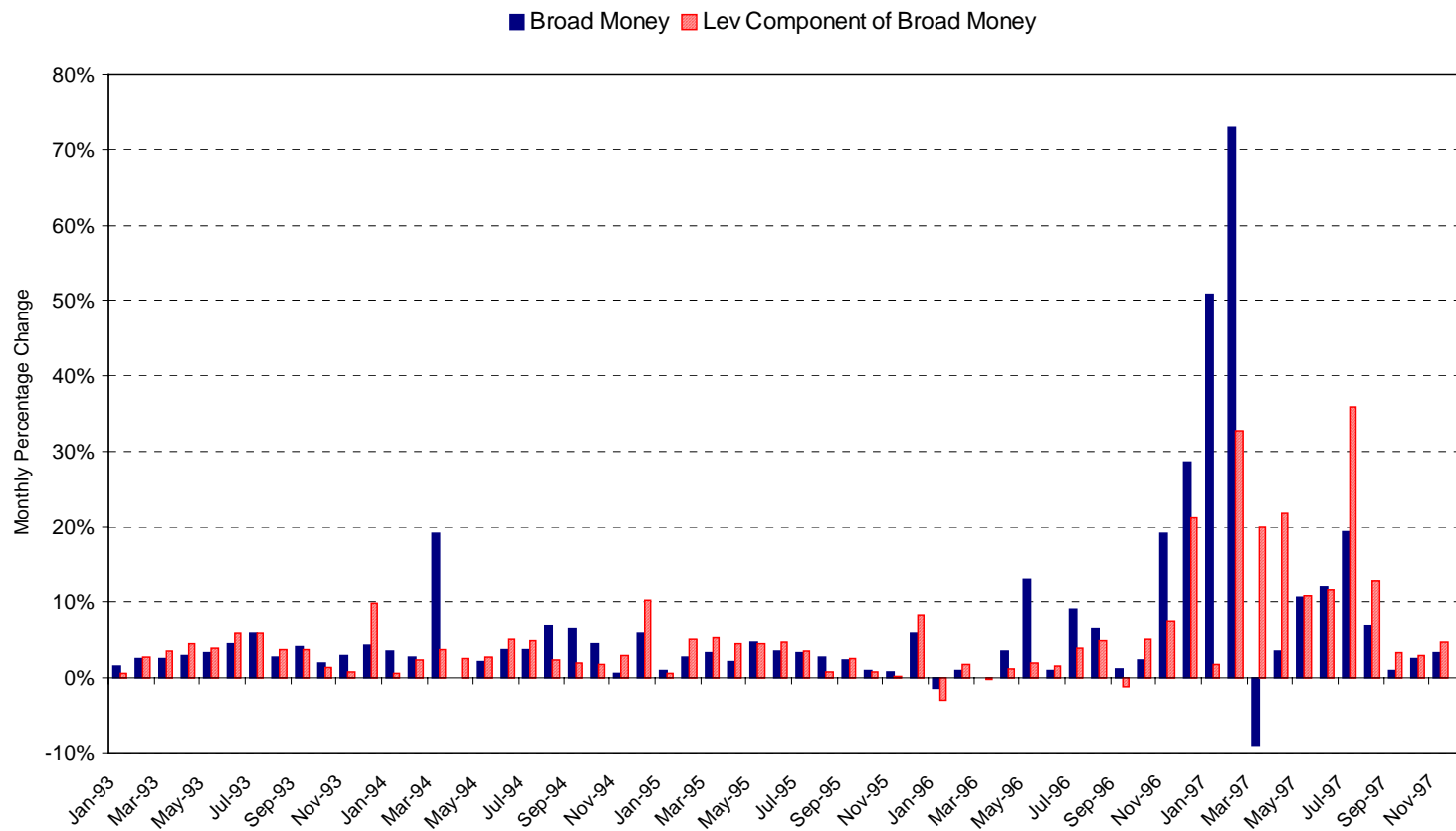


Figure A-8: Basic Interest Rate and Foreign Exchange Market Turbulence, January 1993-December 1997

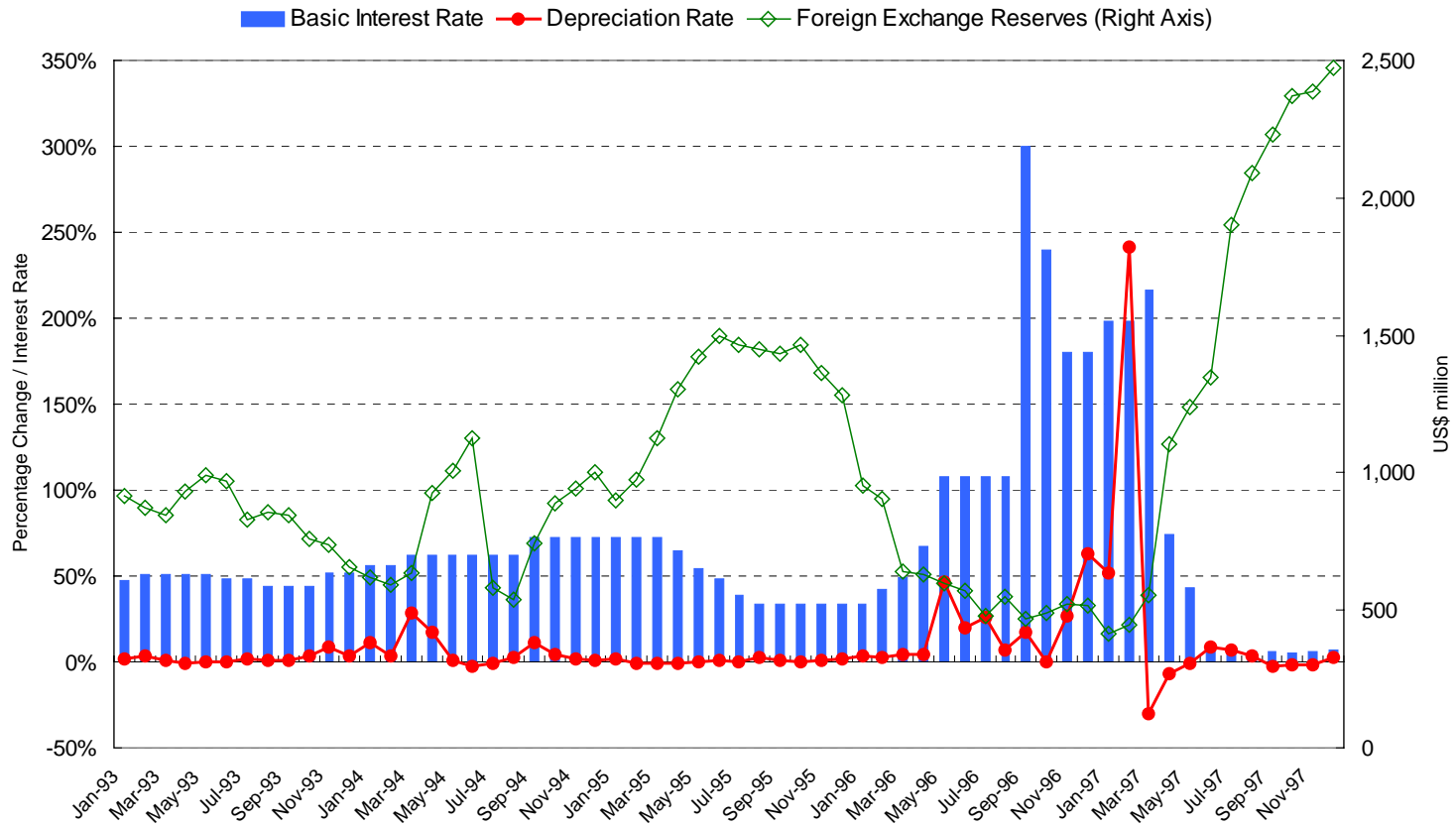
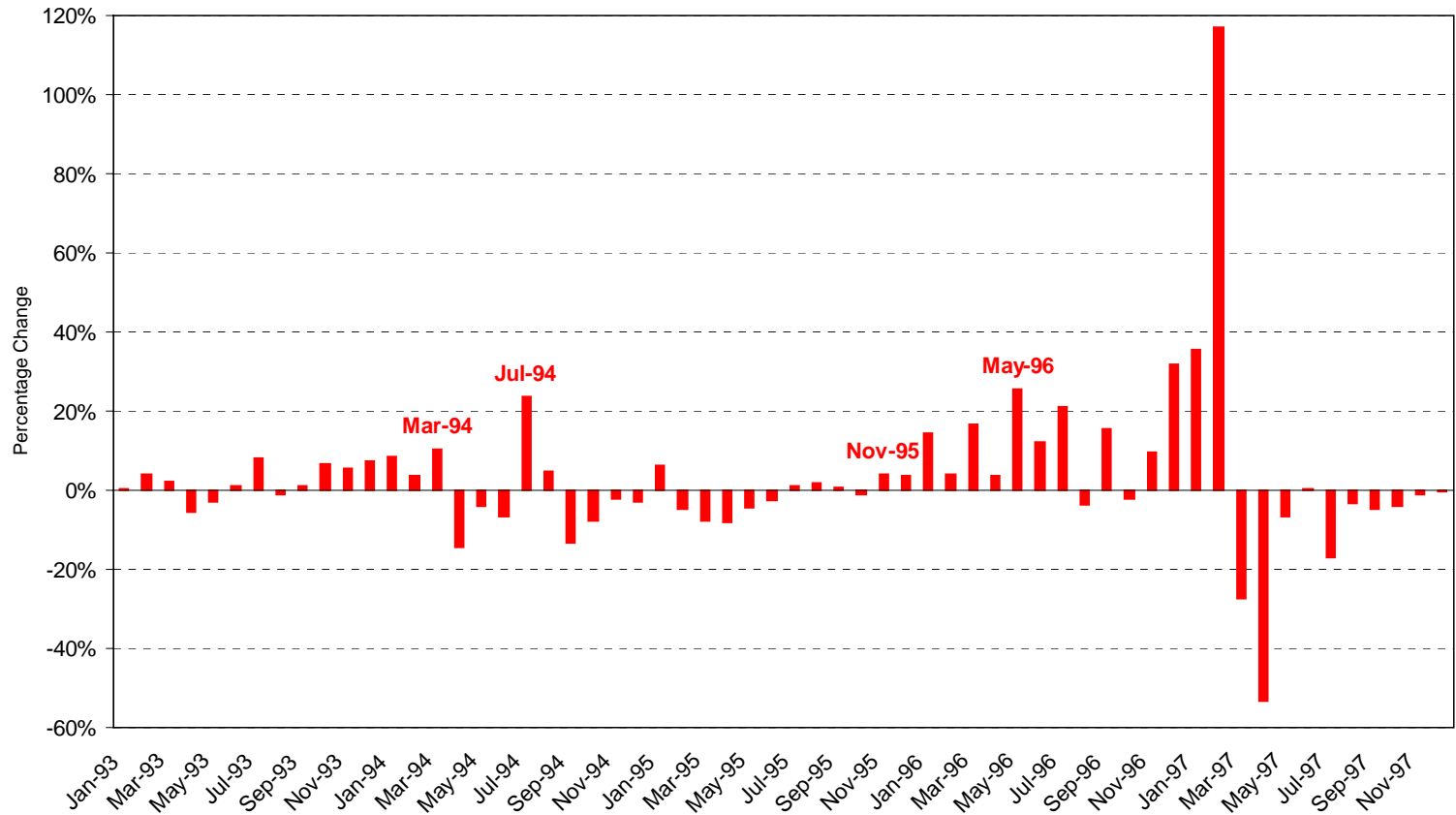
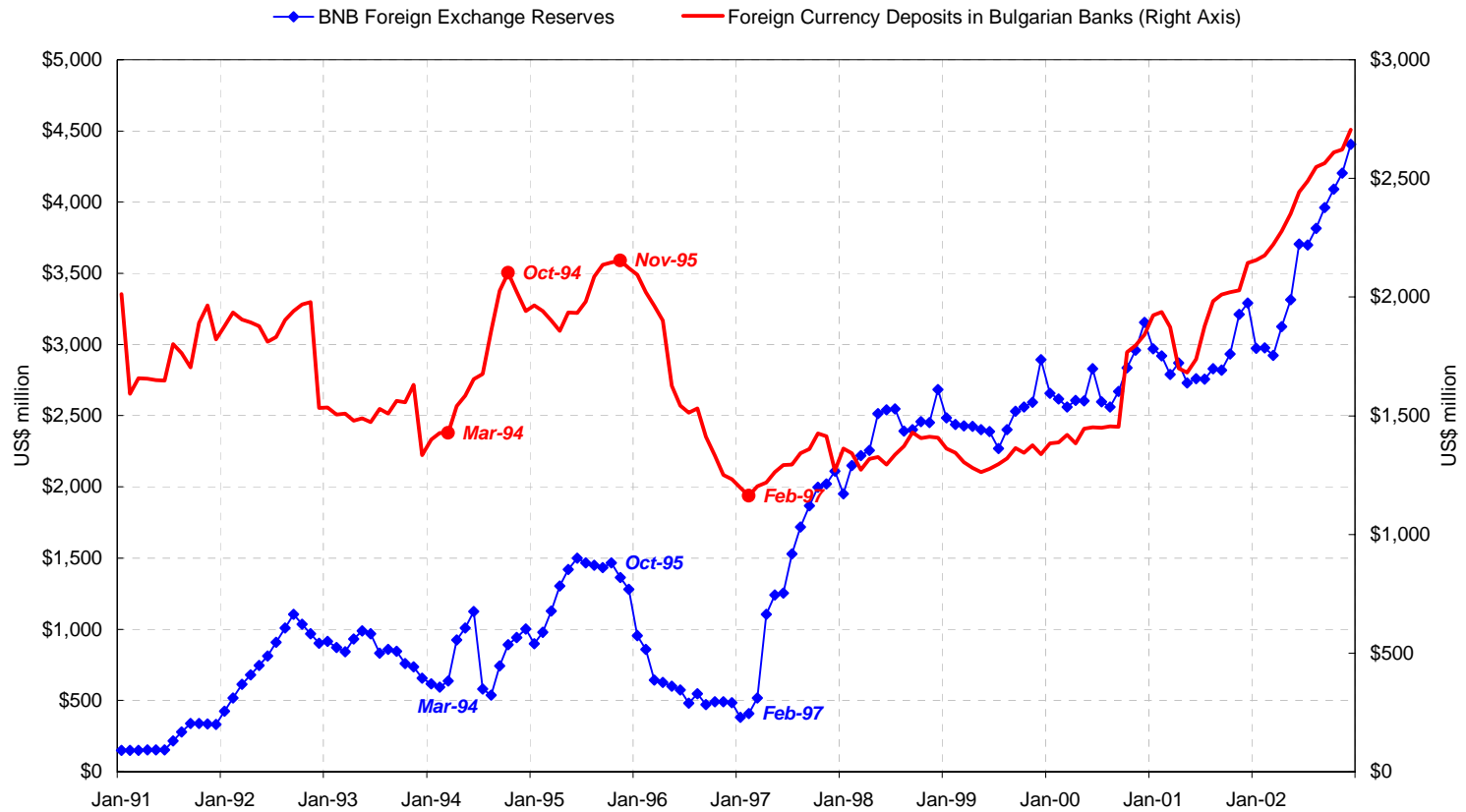


Figure A-9: Index of Foreign Exchange Market Turbulence, January 1993-December 1997



Average of monthly depreciation rate and (negative of) monthly percentage change in BNB's international reserves; large foreign debt payments may distort index (e.g., July 1994)

Figure A-10: BNB Foreign Exchange Reserves and Foreign Currency Deposits in Domestic Banks, January 1991 – December 2002



APPENDIX F: Interest Rate Policy and Stabilization, Addendum to the Literature Review

Calvo and Végh (1995) analyze the use of high interest rates in fighting inflation and defending the exchange rate. They first observe that in many chronic-inflation countries (such as Argentina, Uruguay, and Brazil in the 1980s), this policy was implemented by paying interest on a fraction of the money supply (time deposits of short maturity or even demand deposits). In those countries, nominal interest rates were kept high in order to make domestic currency denominated assets more attractive, and thereby reduce immediate inflationary and/or exchange rate pressures. In Calvo and Végh's model, a perfect foresighted consumer, in a small open economy with fully flexible prices, arbitrages between consumption, cash and demand deposits to maximize lifetime utility. There is no banking system. The government controls the interest rate on demand deposits and the rate of growth of total liabilities (cash plus demand deposits). The composition of its liabilities is demand-determined. Within this framework, the authors demonstrate that a *permanent* rise in the deposit rate provokes a once-and-for-all reduction in the price level, but has no effect on either consumption or the inflation rate (page 59). A *temporary* increase in the deposit rate generates an initial fall in the price level, but the inflation rate increases exponentially afterward (as long as the hike is maintained). The domestic currency appreciates on impact, but begins to depreciate immediately afterward, and may end up at a more depreciated level than initially (page 63). The authors conclude that paying high interest on

money may in fact exacerbate the “*stop-and-go cycles*” that often characterize high-inflation economies (page 63).

Calvo and Végh (1996) is an extension of Calvo and Végh (1995), in the context of a *closed-economy with sticky prices* (prices are sticky in the short-run and revised periodically through staggered adjustments). In this framework, a higher interest rate on money *does* reduce the inflation rate in the short run, but at the cost of a recession. This is true whether the policy is perceived as temporary or permanent. However, when the hike is (perceived as) temporary, the initial reduction in inflation is followed by an upsurge of inflation, over the level prevailing before the policy was implemented (page 1549). The more “*credible*” is the temporary policy, the larger and the more prolonged is the initial fall in inflation.²¹⁰ In the model, a higher deposit rate increases real money demand. Since real money supply cannot change on impact, aggregate demand must fall to equilibrate the money market: inflation falls on impact. With constant (exogenous) monetary growth, however, inflation must rise over its initial level at some point, to bring real money balances back to their initial (steady state) level, (page 1559).

Lahiri and Végh (1998) investigate the effects of interest rate policy on the occurrence and timing of balance-of-payments crises. They first describe crises *à la Krugman* as cases where the monetary authority remains “*passive*” when faced with continuously falling foreign exchange reserves. They explore two alternative policies. The first policy consists of *announcing* an increase in the interest rate paid on domestic-currency-denominated assets in the event of a crisis. If the interest rate is

²¹⁰ Credibility is modeled through a “credibility horizon:” the time at which the hike in the nominal deposit rate is expected to cease.

raised in such a way that the opportunity cost of holding (domestic) money remains constant, there will be a crisis, but no run. The continued expansion of domestic credit will lead to the depletion of foreign exchange reserves and to the abandonment of the peg but there will be no change in real money demand, i.e. no speculative attack. The second policy consists of raising the interest rate before the crisis in order to increase the demand for money and help slowing down the loss of foreign reserves. In this case, the authors show that a balance-of-payments crisis can in fact be delayed forever. How is this possible? The central bank can delay the crisis *“by issuing increasing amounts of interest-bearing debt which is willingly absorbed by the public as a result of higher interest rates”* (page 33).²¹¹ This result however depends on two crucial assumptions: i) the demand for money is never satiated; and ii) money demand becomes more interest-elastic as money holdings rise (Lahiri and Végh recognize that these assumptions are unlikely to hold in practice).

²¹¹ As explained in Chapter 3, this is very important for understanding the conditions leading to the collapse of the Bulgarian economy in late 1996 - early 1997.

APPENDIX G: Ratio of Domestic to Foreign Currency Holdings, Optimality Conditions

The representative agent chooses an optimal sequence $\{c_t, m_t, d_t, m^*_t, d^*_t\}$ for $t = 0 \dots \infty$, to maximize lifetime utility subject to four constraints: a portfolio constraint (Equation (2') in the text), a budget flow constraint (Equation (3')); a cash-in-advance constraint (Equation (4)); and a lifetime resource constraint.²¹²

The Lagrangian for this optimization can be expressed as:

$$L = \sum_{t=0}^{\infty} \gamma^t \{ \log(c_t) + \lambda^1_t [a_t - m_t - d_t - m^*_t - d^*_t] - \lambda^2_t [a_t - a_{t-1} - q + c_t - (i_{t-1} - \varepsilon_t (1+i_{t-1})) d_{t-1} - i^*_{t-1} d^*_{t-1} + \varepsilon_t m_{t-1}] - \lambda^3_t [c_t - (m_t)^\delta (m^*_t)^{1-\delta}] \} \quad \text{Equation A-1}$$

The optimal solution must satisfy:

$$\partial L / \partial c_t = 0 \Leftrightarrow 1 / c_t = \lambda^2_t + \lambda^3_t \quad \text{Equation A-2}$$

$$\partial L / \partial m_t = 0 \Leftrightarrow \lambda^3_t \delta (m^*_t / m_t)^{1-\delta} = \lambda^1_t + \gamma \lambda^2_{t+1} \varepsilon_{t+1} \quad \text{Equation A-3}$$

$$\partial L / \partial d_t = 0 \Leftrightarrow \gamma \lambda^2_{t+1} (i_t - \varepsilon_{t+1} (1+i_t)) = \lambda^1_t \quad \text{Equation A-4}$$

$$\partial L / \partial d^*_t = 0 \Leftrightarrow \gamma \lambda^2_{t+1} \cdot i^*_t = \lambda^1_t \quad \text{Equation A-5}$$

$$\partial L / \partial m^*_t = 0 \Leftrightarrow \lambda^3_t (1-\delta)(m_t / m^*_t)^\delta = \lambda^1_t \quad \text{Equation A-6}$$

²¹² Implying, roughly that the agent cannot die in debt. This can be expressed as $\lim_{t \rightarrow \infty} (1 + \gamma)^t a_t \geq 0$

$$\partial L / \partial a_t = 0 \Leftrightarrow \gamma \lambda_{t+1}^2 = \lambda_t^2 - \lambda_t^1 \quad \text{Equation A-7}$$

Combining (A-4) and (A-5) yields a standard interest parity condition:

$$(1 - \varepsilon_{t+1}) i_t = i_t^* + \varepsilon_{t+1} \quad \text{Equation A-8}$$

This is Equation (7) in the text.

Combining (A-3) and (A-6) leads to:

$$\left(\frac{i_t^* + \varepsilon_{t+1}}{i_t^*} \right) = \frac{\delta}{(1 - \delta)} \left(\frac{m_t^*}{m_t} \right) \quad \text{Equation A-9}$$

Equation (6) in the text, the optimal currency ratio, is obtained by combining (A-8) and (A-9):

$$\frac{m_t}{m_t^*} = \frac{\delta}{(1 - \delta)} \left(\frac{i_t^*}{(1 + \varepsilon_{t+1}) i_t} \right) \quad \text{Equation A-10}$$

APPENDIX H: Political Instability in Bulgaria, 1990-1997

Table A-21: Governing Bulgaria, Seven Years of Instability, 1990-1997

Period	Prime Minister	The Government	Main Achievements
July 90 – December 90	Andrei Lukanov	Bulgarian Socialist Party (BSP), “comparatively progressive”	Unable to rule.
December 90 – October 91	Dimitur Popov, judge	Government of national unity, with the BSP, Union of Democratic Forces (UDF) and BANU	Emergency economic measures: price and foreign exchange liberalization in February 1991, foreign investment law, commercial code, and competition law. New constitution passed in July 1991.
October 91 – December 92	Filip Dimitrov	Anti-communist, UDF with support of the MRF	Privatization law, revamped foreign investment law. Scandal. Vote of confidence lost.
December 92 – October 94	Lyuben Berov, historian	Government of experts supported by MRF, BSP and “a breakaway faction” of the UDF	Government under fire from President Zhelev, MRF and Trade Unions. Drastic depreciation of the Lev in March 1994 increased Government’s unpopularity. June 1994: settlement with international debtors.
October 94 – January 95	Reneta Indjova	Caretaker Government	
January 95 – December 96	Zhan Videnov	Former communists with support of the BBB	Neglected promised structural reforms. Suspicions of corruption among Videnov’s entourage. Large bank failures undermined confidence in the Lev, which started to fall sharply in April 1996. The IMF denied Bulgaria the money needed to replenish reserves. Government ousted by

Period	Prime Minister	The Government	Main Achievements
			popular discontent after Videnov's resignation and designation of Nikolay Dobrev as next premier by BSP.
February 97 – April 97	Stefan Sofianski, mayor of Sofia	Caretaker Government, UDF aligned	End of fuel shortages, Lev stabilized, inflation brought down, agreement with the IMF.
May 97 – December 97	Ivan Kostov	Anti-communist coalition, led by the UDF	Currency Board in July 1997, economic recovery, important legislation on banking and crime control.