Twin Deficits and Sudden Stops

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Abstract

Many countries experienced severe financial crises during the last 35 years. Mexican, Asian and Russian crises are the most well known crises that occurred in the 90s. Sudden capital flow reversals, known as sudden stops, often accompany these crisis episodes. The explanations of the crises vary among the crisis models. The latest models discount the importance of twin deficits. This paper investigates the effect of twin deficits (fiscal and trade deficits) on the likelihood of sudden stops and whether the role of twin deficits changed across the decades of the 1970s, 80s and 90s. Probit analysis is conducted on the data of 42 developing countries from 1970 to 2004. This sample includes 25 emerging market countries as well. Results support the hypothesis that the influence of twin deficits declined over the decades, but they still played a significant role in the 90s.

1. Introduction

Many countries experienced severe financial crises during the last 35 years. Sudden capital flow reversals, known as sudden stops, often accompany these crisis episodes. The explanations of the crises vary among the crisis models. Early models that were developed in the 70s and 80s, focused on the inconsistent macroeconomic policies that produce the imbalances in fiscal and current accounts. The latest models discount the importance of twin deficits and introduce other explanations (i.e. the possibility of multiple equilibrium, "moral hazard," "balance sheet" effects, etc.). Many economists still disagree on which model explains the crises better. The need to understand them is great for policy reasons and for international investors. Most recently Mexican, Asian, Russian and Argentinean crises have caused a great despair to millions of people. Some estimates of potential welfare losses from Asian crisis show 40-60% loss in GDP.

This paper investigates the effect of twin deficits (fiscal and trade deficits) on the likelihood of sudden stops and whether the role of twin deficits changed across the decades of the 1970s, 80s and 90s. Probit analysis is conducted on the data of 42 developing countries from 1970 to 2004. This sample includes 25 emerging market countries as well. Results support the hypothesis that the influence of twin deficits declined over the decades, but they still played a significant role in the 90s.

2. Theory

The first generation currency crisis model, proposed by Salant and Henderson (1978) and developed by Krugman (1979), suggests that currency crises are predictable by the state of the countries' economic fundamentals. If a country has bad economic fundamentals (low GDP

growth, excessive twin deficits, high inflation, etc.), then it is a matter of time that there will be a crisis to correct a disequilibrium. The second generation crises model (Obstfeld, 1994) argues that "even sustainable pegs may be attacked and even broken," which means that even if the fundamentals are not so bad[1], self-fulfilling attacks on the currency could drive markets to believe, for known (behavioral and information asymmetry problems) or unknown reasons, that currency rate will fall, thus causing a panic, capital flight and crisis.

Numerous studies have been conducted on Mexican, Asian, Russian and Argentina's currency crises. The results have been mixed. Salvatore (1999) sees similarities in these crises, but others like Stiglitz and Furman (1998) emphasize the unpredictability of Thai Baht crisis based on the fundamentals at play. This paper adopts composite variables approach from Nitithanprapas and Willett (2000), where variables are converted to dummies using thresholds and then combined in composite variables to check if simultaneous disequilibria of 2 or more variables could predict the crisis.

2.1 Twin Deficit Effects

Open economy macroeconomics demonstrates the relationship between budget deficits and current account deficits. A government budget deficit pushes real domestic interest rates up and this attracts foreign capital inflows, which in turn leads to the appreciation of the domestic currency. The result is a current account deficit. According to the "Lawson's Doctrine," a current account deficit must be a concern only when it is caused by a fiscal deficit.

Hypothesis 1:

When budget deficit is excessive (this paper uses -5% threshold for budget balance/GDP, Salvatore (1999) considers that even -3% is problematic for economic stability) and at the same

[1] The first generation model only breaks economic fundamentals in good and bad zone, whereas the second generation models use good, vulnerable (intermediate) and bad zone.

time country runs current account deficit, foreign investors will be worried about the currency devaluation and they will withdraw capital from the country. In other words, twin deficits increase the probability of a sudden stop.

2.2 Protective role of reserves

Foreign reserves are used by countries to protect themselves from speculative attacks and reduce the likelihood of the currency crisis, and/or reserves accumulate due to mercantilist behavior. Increased capital mobility in the 80s and 90s made countries more vulnerable to attacks and, therefore, foreign reserves became more important.

Hypothesis 2:

The lower level of foreign reserves increased the probability of a sudden stop in the 80s and 90s.

2.3 Effects of Twin Deficits over different decades

Due to the increased capital mobility and decrease in capital flow restrictions in the 80s and 90s, destabilizing or stabilizing speculations may force countries with intermediate economic fundamentals into crisis.

Hypothesis 3:

The influence of twin deficits on sudden stops declined in the 80s and 90s.

3. Empirical Methodology

This paper uses Probit model of estimation to test each hypothesis for the decades of 70s, 80s and 90s separately and in combination. The data is taken from IFS database of International Monetary Fund (2005). Tables 4, 5 and 6 report the marginal effects of each independent

variable. The dependent variable is a sudden stop dummy, which is calculated by the following formula: $\frac{K_{t-1} - K_t}{Y_{t-1}} > 0.05$ and $K_{t-1} > 0$. Where K_t is net capital flows at time *t* and Y is nominal GDP. This dependent variable takes values of 1 if the condition holds, and 0 otherwise.

Main equation for all models is:

$$Sudden\ Stop\ Dummy = b_1 + b_2 COM1 + b_3(Low\ Reserves\ Dummy) + b_4(Exchange\ Rate\ Rapid\ Appreciation\ Dummy) + \Sigma b_i(X_i) + \varepsilon$$

Description of variables:

To test the affects of the simultaneous occurrence of budget and current account deficits, I converted some of the independent variables into dummy variables using theory motivated threshold values. Initial empirical analysis was done with actual values of variables and the obtained results were similar.

These are the constructed explanatory variables:

COM1=1, if Current Account/GDP<-0.05 and Budget Balance/GDP<-0.05 (simultaneously), and equals 0 otherwise. Salvatore (1999) used -3% threshold for Budget Deficit/GDP. According to the hypothesis 1 sign of COM1 coefficient should be positive.

Low Reserves Dummy=1, if Short-term Foreign Debt/Reserves>1 and 0 otherwise. When Short-term Foreign Debt/Reserves>1, country has a full capacity for all short-term foreign debt repayment, which would adequately protect foreign investors.

Exchange Rate Rapid Appreciation Dummy=1, if %change in exchange rate>10% and 0 otherwise.

All of the above described variables are expected to have positive marginal effects on the probability of next year's Capital Flow Reversal.

Robustness Checks:

Robustness checks were conducted by changing time period of the observations and sample of countries, using different thresholds, including and excluding variables, including emerging market dummy, using robust white estimator, and using Logit model instead of Probit.

4. Empirical Results

Tables 1, 2 and 3 report the summary statistics of the variables and the correlation coefficients. None of the variables are highly correlated, using the full sample, which reduces the multicollinearity in the regressions.

Tables 4, 5 and 6 present marginal effect results that support Hypothesis 1. COM1 is highly significant across most of the regressions. The sign of the COM1 is as predicted; it is positive all across the Table 1 regressions. When I included low reserves dummy and exchange rate rapid appreciation dummy, COM1 still stayed significant in the combined period sample.

Hypothesis 3 is also supported by the results in regressions 1, 2 and 3 in table 4 and in regressions 1, 2 and 3 in table 5. Since COM1 is a dummy variable, Probit marginal effects could be interpreted as marginal probability effects on the dependent variable. The COM1 effects in the 70s is 31% and then drops to 12% in the 80s and 14% in the 90s. The probability of the crisis, as predicted by excessive twin deficit, drops by a half after the 70s.

Hypothesis 2 is also supported by the results. Table 6 shows that low reserves played little role in the crisis of the 70s and 80s, whereas, in the 90s, low reserves dilute the significance of the COM1 variable (twin deficit dummy), it is only border line significant at 17% level.

5. Conclusion

Recent studies disagree on the role of twin deficits, joint occurrence of budget and current account deficits, in the financial crises that took place during the last 35 years. This paper

studied the relationship of twin deficits and sudden stops with the annual data of 42 developing countries from 1970 to 2004. The composite dummy variable was used to measure twin deficit effect on sudden stops. The results support the idea that sudden stops of the 70s were different in nature from the 80s and 90s' crises. The twin deficit coefficient is significant in all of the three decades for this sample of countries. The importance of twin deficits in predicting the crisis clearly declines over these decades. It could be that fewer countries are taking the risk of running twin deficits. Moreover, the second generation crisis model could also have some validity, where sudden stops could still be triggered even during the absence of twin deficits or current account deficits by self-fulfilling speculative attacks.

Possible extensions from this paper would test the model on a different sample of countries and use capital control and exchange rate regime variables.

References:

Greene, H. W. *Econometric Analysis* (5th ed. New Jersey: Prentice Hall, 2003).

Edwards, S. (2001). "Does the Current Account Matter?", *NBER Working Paper* No. 8275.

Edwards, S. (1998) "Capital Flows, Real Exchange Rates, and Capital Controls: Some Latin American Experiences" *NBER Working Paper* No. 6800.

Fischer, S. (2001) "Exchange Rate Regimes: Is the Bipolar View Correct?" *Journal of Economic Perspectives*, v.15, pp.3-24.

Furman, J. and J. Stiglitz. (1998). "Economic Crises: Evidence and Insights from East Asia." *Brookings Papers of Economic Activity* 2:1-114.

Goldstein, M. (1997). "Commentary." In *Maintaining Financial Stability in a Global Economy.* Pp 97-116. Kansas City: Federal Reserve Bank of Kansas City.

Goldstein, M. and C. Reinhart. (1999). *Forecasting Financial Crises: Early Warning Signals for Emerging Markets.* Washington D.C.: Institute for International Economics.

Hutchinson M., and I. Noy (2002) "Sudden Stops and the Mexican Wave: Currency Crises, Capital Flow Reversals and Output Loss in Emerging Markets" *Pacific Basin Working Paper Series,* No.02-03.

International Monetary Fund, (2005) IFS database.

Krugman, P. (1979). "A model of balance-of-payments crises." *Journal of Money, Credit, and Banking* 11:311-325.

Obstfeld, M. (1994). "The logic of currency crisis." *Cahiers Economques et Monetaires* (Bank of France) 43:189-213.

Obstfeld, M. (1996). "Models of currency crises with self-fulfilling features." *European Economic Review* 40:1037-1048

Obstfeld, M., and K. Rogoff. (1995). "The mirage of fixed exchange rates." *Journal of Economic Perspectives* 9:73-96.

Radelet, S., and J. Sachs. (1998) "The East Asian Financial Crisis: Diagnosis, Remedies, Prospects." *Brookings Paper of Economic Activity* 1, pp.1-90

Rodrik, D. and A. Velasco (1999). "Short Term Capital Flows", *NBER Working Paper No.7364*.

Sachs, J., A. Tornell and A. Velasco (1996). "Financial Crises in Emerging Markets: The Lessons from 1995." *Brookings Papers on Economic Activity* 1:147-215.

Salant, S., and D. Henderson. (1978). “Market anticipation of government policy and the price of gold.” *Journal of Political Economy* 86:627-648.

Salvatore, D. (1999). “Could the Financial Crisis in East Asia Have Been Predicted?” *Journal of Policy Modeling* 21: 341-347.

Stiglitz, J.E. and A. Weiss (1981) “Credit Rationing in Markets with Imperfect Information”, *American Economic Review*, Vol. 72, pp. 393-410. 24

Sula, O. (2004) “Surges and Sudden Stops of Capital Flows to the Developing World”, Working Paper, Claremont Graduate School.

Willett, T. and E. Nitithanprapas (2000) "A Currency Crises Model That Works: A Payments Disequilibrium Approach", CMC Working Paper.

Willett, T., E. Nitithanprapas, I. Nitithanprapas, and S. Rongala (2004b). “The Asian Crises Reexamined”, *Asian Economic Papers* (forthcoming).

Willett, T. (2000) “International Financial Markets as Sources of Crises or Discipline: The Too Much, Too Late Hypothesis” *Princeton Essays in International Finance*, No.218

Table 1. Summary Statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
net capital flows	1007	1,366.59	6,139.96	-34,435.00	39,966.00
M2 / reserves	1183	9.85	16.72	0.00	268.56
short-term foreign debt / reserves	982	1.63	2.59	0.00	31.43
current account balance / GDP	986	-0.02	0.07	-0.37	0.81
budget balance / GDP	994	-0.03	0.09	-0.86	0.78
real effective exchange rate index	863	117.29	51.13	48.44	632.26
GDP	1250	82,530.79	143,803.00	0.00	1,409,852.00

Table 2: Correlation Coefficients Between Continuous Variables
(obs=551)

Variable	net capital flows	M2 / reserves	short-term foreign debt / reserves	current account bal / GDP	budget balance / GDP	real effective exchange rate index	GDP
net capital flows	1.00						
M2 / reserves	0.00	1.00					
short-term foreign debt / reserves	-0.07	**0.59**	1.00				
current account balance / GDP	**-0.27**	-0.06	-0.14	1.00			
budget balance / GDP	0.07	-0.16	-0.11	0.07	1.00		
real effective exchange rate index	0.05	0.17	0.04	-0.12	-0.08	1.00	
GDP	**0.49**	0.03	-0.11	0.12	0.02	0.01	1.00

Table 3: Correlation Coefficients Between Dummy Variables
(obs=1470)

Variable	Sudden Stop dummy (dependent variable)	COM1[§]	low reserves dummy=1 if Short-term foreign debt / reserves>1	exchange rate rapid appreciation dummy=1 if %change in exchange rate >10%	emerging markets dummy
Sudden Stop dummy (dependent variable)	1.00				
COM1	0.17	1.00			
Low reserves dummy=1 if Short-term foreign debt/reserves>1	0.05	0.11	1.00		
Exchange rate rapid appreciation dummy=1 if %change in exchange rate >10%	0.01	-0.01	0.09	1.00	
emerging markets dummy	-0.04	-0.08	0.11	0.09	1.00

[§]COM1=1, if Current Account/GDP<-0.05 and Budget Balance/GDP<-0.05 (simultaneously), and equals 0 otherwise.

Table 4. Estimated Marginal Effects at Mean (Standard Errors in Parenthesis)

Dependent Variable	Sudden Stop Dummy						
	Probit Model						
Regression #	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Independent Variables	*1970-1980*	*1980-1990*	*1990-2000*	*1970-2004*	*1970-2004*	*1970-2004*	*1970-2004*
COM1 (excessive twin deficit dummy)	0.30*** (0.10)	0.13** (0.06)	0.14** (0.098)	0.18*** (0.05)	0.17*** (0.05)	0.17*** (0.05)	0.18*** (0.05)
Low Reserves Dummy =1 if Short-term Foreign Debt/Reserves>1					0.017 (0.014)	0.016 (0.014)	
Exchange Rate Rapid Appreciation Dummy =1 if %change in exchange rate >10%					0.002 (0.024)		0.005 (0.025)
M2 / Reserves							
Short-term Foreign Debt / Reserves							
Real Effective Exchange Rate Index							
Emerging Market Dummy							
Log-likelihood	-53.74	-115.37	-136.89	-324.40	-323.62	-323.62	-324.38
# of Observations	462	462	462	1470	1470	1470	1470
Pseudo R^2	0.19	0.03	0.01	0.04	0.04	0.044	0.04

* significant at the 10% level
** significant at the 5% level
*** significant at the 1% level

COM1=1, if Current Account/GDP<-0.05 and Budget Balance/GDP<-0.05 (simultaneously), and equals 0 otherwise.

Table 5. Estimated Marginal Effects at Mean (Standard Errors in Parenthesis)

Dependent Variable	Sudden Stop Dummy						
	Probit Model						
Regression #	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Independent Variables	*1970-1980*	*1980-1990*	*1990-2000*	*1970-2004*	*1970-2004*	*1970-1980*	*1990-2000*
COM1 (excessive twin deficit dummy)	0.31*** (0.10)	0.12** (0.06)	0.14** (0.10)	0.18*** (0.05)	0.17*** (0.05)	0.285*** (0.12)	0.10 (0.10)
Low Reserves Dummy =1 if Short-term Foreign Debt/Reserves>1					0.018 (0.014)		
Exchange Rate Rapid Appreciation Dummy =1 if %change in exchange rate >10%					0.004 (0.024)		
M2 / Reserves						-0.0017 (0.0014)	-0.003 (0.003)
Short-term Foreign Debt / Reserves						0.0057 (0.0047)	0.004 (0.014)
Real Effective Exchange Rate Index							
Emerging Market Dummy	Variable is dropped. It perfectly predicts 0.	-0.021 (0.026)	0.01 (0.03)	-0.013 (0.014)	-0.016 (0.014)		
Log-likelihood	-51.32	-115.09	-136.84	-323.99	-323.03	-37.71	-111.54
# of Observations	363	462	462	1470	1470	268	365
Pseudo R^2	0.178	0.03	0.01	0.431	0.046	0.178	0.014

* significant at the 10% level
** significant at the 5% level
*** significant at the 1% level

COM1=1, if Current Account/GDP<-0.05 and Budget Balance/GDP<-0.05 (simultaneously), and equals 0 otherwise.

Table 6. Estimated Marginal Effects at Mean (Standard Errors in Parenthesis)

Dependent Variable	Sudden Stop Dummy				
	Probit Model				
Regression #	*1*	*2*	*3*	*4*	*5*
Independent Variables	*1970-1980*	*1980-1990*	*1990-2000*	*1970-2004*	*1970-2004*
COM1 (excessive twin deficit dummy)	0.29*** (0.10)	0.12** (0.06)	0.13 (0.09)	0.17*** (0.05)	0.17*** (0.05)
Low Reserves Dummy =1 if Short-term Foreign Debt/Reserves>1	0.008 (0.016)	0.013 (0.024)	0.076 (0.18)	0.016 (0.014)	0.018 (0.014)
Exchange Rate Rapid Appreciation Dummy =1 if %change in exchange rate >10%					0.004 (0.024)
M2 / Reserves					
Short-term Foreign Debt / Reserves					
Real Effective Exchange Rate Index					
Emerging Market Dummy					
Log-likelihood	-53.62	-115.21	-136.80	-323.62	-323.03
# of Observations	462	462	462	1470	1470
Pseudo R^2	0.19	0.03	0.01	0.044	0.046

* significant at the 10% level
** significant at the 5% level
*** significant at the 1% level

COM1=1, if Current Account/GDP<-0.05 and Budget Balance/GDP<-0.05 (simultaneously), and equals 0 otherwise.