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Chronicle of Currency Collapses and the Effects on Output: Evidence from Six Asian Countries[1]

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Abstract

The main goal of the present paper is to analyze the effects of currency collapses (a large devaluation of country's nominal exchange rate) on real gross domestic products of six Asian countries (Iran, Indonesia, Malaysia, Pakistan, South Korea, and Turkey). A yearly data is collected from the WDI of the World Bank over the period 1980-2011. The econometric model includes the real GDP growth rate, inflation rate, and dummy variable (as a proxy variable for the currency collapse devaluation). The currency collapse devaluation is calculated using a criterion similar to M. Bussiere et al.

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(Journal of International Money and Finance, Vol.31, 2012: 680-708). Applying a panel econometric method, the estimated results show that both the inflation rate and currency collapses affect the real GDP growth rate negatively. The implication of finding is that the persistence of the currency crash matters for selected Asian countries.

***Keywords**: Currency collapse, GDP growth rate, Six Asian Countries.*

***JEL Classification:** E17, E27, E31*

1. Introduction

The purpose of this paper is to examine the impact of large exchange rate changes - devaluation or depreciation - on output in six Asian economies. In particular, we test whether devaluations are contractionary in these economies. We focus on these developing economies for several reasons. First, empirical evidence on this issue from these set of countries is lacking. To our best knowledge, this is the first study providing evidence on the impact of devaluations in six Asian economies. Second, these economies are relatively small and open, relying heavily on export revenues to promote economic growth.

Devaluation has been prescribed and used increasingly as a stabilization device in developing countries, as part of International Monetary Fund orthodox adjustment programs. The conventional treatment is based upon the proposition that devaluation improves competitiveness, boosts exports and switches demand towards domestic produced goods, ultimately expanding the production of tradable. In addition, countries that undergo real depreciations are believed to have better chances in the journey toward more open economies and sustained growth, since a more depreciated exchange rate will likely prevent destabilizing financial crises, such as occurred in Mexico during 1982 and 1995 (Bahmani-Oskooee and Miteza, 2006).

In the latter half of the 1990's, a number of countries experienced substantial currency depreciations. These depreciations include not only the well-known currency crises where countries abandoned pegged exchange rates, such as in Thailand and South Korea in 1997, but also less well-documented examples where countries with more flexible exchange rates experienced unusually large depreciations, such as in Mexico and South Africa in 1998. In some cases, these depreciations were followed by a surge in production and improvement in economic growth, while in other cases the depreciations were followed by a decline in output and severe recession

(Forbes, 2002).

The proposition that devaluations are genuinely expansionary has encountered serious challenges from theoretical and empirical studies, according to which devaluations are contractionary. The "orthodox" school advocates the argument that devaluation is expansionary because of its expenditure switching effects and the increased production of tradables that it stimulates. But exports of developing economies may not be as responsive to devaluation since their products are not of the same quality as those of industrial economies. In addition, devaluation can cause output to contract because of other factors. First, devaluation can cause a contraction of aggregate demand because, among other things, it redistributes income towards economic entities with high marginal propensity to save; it makes capital investment more expensive, and increases debt and debt service payments in local currency. Second, devaluations may also reduce aggregate supply as the price of imported production inputs increases, wages increase when based on price levels, and working capital grows costlier as real balances decline (Miteza, 2006).

The aim of this paper is to revisit the relation between large currency devaluations and real GDP. We focus on the following question: what are the short- and long-run effects of large currency devaluations on output dynamics? Unlike most existing literature, which has relied on small cross-section or short time series samples, our paper employs a panel for six Asian economies over the period 1980-2011.

The rest of the paper is organized as follows. Section II reviews the relevant literature. In section III, the methodology of study is presented. Section IV describes the sources of data and data transformation. Results are reported in section V, and conclusions are drawn in section VI.

2. Literature Review

One of the most prominent early econometric studies regarding the effect of devaluation on output is by Edwards (1986a). He estimates a model of real

output behavior based on data from 12 developing countries over the period 1965-80. His least square dummy variable model indicates that devaluations appear to be neutral in the long run. Devaluations tend to reduce output in the first year, but this effect is completely offset during the second year. Consistent with his previous conclusions, Edwards (1989b) finds that devaluations are contractionary in the short run, however, they remain neutral in the long run. Khan (1988) uses a similar approach by covering 67 countries over period 1973-1986 and he finds that the exchange rate variable effect on output is insignificant.

Nunnenkamp and Schweickert (1990) test the hypothesis of contractionary effect of devaluation on growth by using data for 48 developing countries. A pooled time series is used to test the relation between GDP growth per capita and exchange rate. The result rejects the hypothesis that countries exported manufactured goods mainly face contractionary effect in the short run but these effects are offset by the positive effects in the long run. However for exporters of agricultural product devaluation has expansionary effects in the short and long run. Agenor (1991) examines a pooled sample of 23 developing countries to consider the deviation of actual from expected changes in the real exchange rate. The result shows that unexpected real exchange rate depreciation is expansionary, while anticipated real depreciations have an irreversible contractionary effect. Kamin and Klau (1998) examine a dataset of pooled annual observations from 27 countries. They tackle the long run effects of devaluation and fail to find support for the contractionary devaluations hypothesis, or that contractionary devaluations are only a developing country phenomenon. Using a different time horizon for 23 LDCs, Bahmani-Oskooee (1998) validate the hypothesis of neutral devaluation effects with respect to output in the long run. Upadhyaya (1999) considers a dataset

drawn from 6 Asian countries and finds that only in two out of five countries devaluations are contractionary in the long-run. Acar (2000) takes a sample of 18 LDCs with different export performances. The result shows a negative relation between devaluation of currency and output only during the first year, a positive effect the next year and zero growth in the long run as the two effects cancel out in the future. Mitchell and Pentecost (2001) find devaluations contractionary in a panel study of 5 countries in the short-run as well as the long run. The long run contractionary effect is somewhat mitigated by a rise in output one year after the devaluation. In contrast, Karadeloglou et al. (2001), using a wage-price-GDP model, find devaluations to be slightly expansionary in one out of three countries, only initially expansionary, but with no long run effect, in the second country, and contractionary in the third one. Chou and Chao (2001) employ a dataset across 5 Asian economies (including South Korea) and show that there is no long run relationship between real output and real exchange rate. Bahmani - Oskooee et al. (2002) investigate the effect of currency depreciation on output in Asian countries. They found that in many Asian countries depreciation is contractionary. Magendzo (2002) uses a dataset of 155 countries and finds that the contractionary effect of currency devaluations vanishes once selection bias is taken care of. Using alternative definitions of devaluations, he concludes that devaluations show no statistically significant effect on output growth. In contrast, Ahmed et al. (2002) compare devaluation episodes across a group of developing and industrial economies, where industrial economies are split according to their exchange rate regimes. They find that for industrial countries both, devaluations and depreciations are expansionary, while for developing countries devaluations are contractionary. Christopoulos (2004) considers panel data of 11 Asian countries (including South Korea); the estimated model provided empirical support for contractionary devaluation in the long-run. It is found that, in the

long run, in 5 out of 11 countries and for the panel as a whole, depreciation exerts a negative impact on output growth while for three countries depreciation improves growth prospects. Upadhyaya et al. (2004) study the effect of currency depreciation using panel data and finds that while the exchange rate depreciation is expansionary in the short run, it is neutral in the medium and long run. In a study of 42 countries (18 OECD and 24 non - OECD), Bahmani-Oskooee and Miteza (2006) find that for all countries, as well as an extended period for non-OECD countries, the model reveals that in the long-run, nominal exchange rate devaluations are contractionary. This finding is confirmed in all model specifications for non-OECD countries as compared to OECD countries. A study by Miteza (2006), the impact of real exchange rate devaluation on aggregate output for a group of five transition economies is examined. The estimation of the long run relationship reveals that devaluations are contractionary in the long run. Kalyoncu et al. (2008) study the effect of currency devaluation on output level of 23 OECD countries and find that output growth is affected by currency devaluations in the long run in 9 out of 23 countries. In 6 out of 9 countries, depreciation exerts a negative impact on output growth; however, depreciation improves output in 3 countries. Bussière et al. (2012) provide new empirical evidence using a dataset for 108 emerging and developing economies (including Iran and South Korea) over the period 1960–2006. Main finding is that currency collapses are associated with a permanent output loss relative to trend.

The literature has put less attention to what happens to output after a currency collapse. Key exceptions include Hutchison and Noy (2002), Hong and Tornell (2005), Gupta et al. (2007), Tovar (2010), and Bussière et al. (2012). However, there is no systematic study regarding our 6 Asian economies examining this relationship. In general, the effect of currency

collapses on output still remains unsettled in the empirical macroeconomic literature.

Table 1: Summary of Some Empirical Results of Exchange Rate Devaluation Effect on Economic Growth

	Period	Countries	Short run	Long run
Edwards (1986)	1965-80	12 developing countries	Contractionary	Neutral
Khan (1988)	1973-1986	67 countries	---	Statistically insignificant
Edwards (1989)	1965-84	12 developing countries	Contractionary,	Neutral
Nunnenkamp & Schweickert (1990)	1982- 1987	48 developing countries	Contractionary, for exporters of manufactures	Expansionary for exporters of agricultural products
Agenor (1991)	1978-1987	23 developing countries	Contractionary?	Contractionary?
Kamin & Klau (1998)	1970-1996	27 countries (Latin America, Asia and Industrialized world	---	Neutral
Bahmani-Oskooee (1998)	1973-1988	23 LDCs	---	Neutral
Chou & Chao (2001)	1966-1998	5 Asian countries	Contractionary?	Neutral
Magendzo (2002)	1970–1999	155 countries	---	Neutral
Ahmed (2003)	1983-1999	5 Latin American Countries	---	Contractionary
Christopoulos (2004)	1968-1999	11 Asian countries (S. Korea included)	----	Contractionary, 5 out of 11. Expansionary for 3
Bahmani-Oskooee & Miteza (2006)	1988-97	42 countries (18 OECD and 24 non-OECD)	----	Contractionary
Miteza (2006)	1993-2000	five transition economies	---	Contractionary
Bussière, Saxena, & Tovar E. (2012)	1960–2006	108 emerging and developing economies	---	Contractionary

Source: Author's collection.

3. Methodology

The following two-way fixed effects panel regression is applied to examine the impact of currency collapses on output growth rates (Bussière et al., 2012):

$$g_{i,t} = \sum_{j=-3}^{+3} \beta_j D_{i,t-j} + \delta . Infla_{i,t} + v_i + w_t + \varepsilon_{i,t} \; i = 1,...,n \quad , \quad t = 1,...,T \qquad (1)$$

where $g_{i,t}$ is real GDP growth rate in country i in year t; $Infla_{i,t}$ is the inflation rate; and $D_{i,t-j}$ is a dummy variable for currency collapses. Specifically, $D_{i,t-j}$ is equal to one if country i has a currency collapse in period t. The regression includes the unobserved effects, where v_i is an idiosyncratic time-constant but cross-sectional varying component; w_t is the time-varying but cross-section constant factor; and $\varepsilon_{i,t}$ is the standard error term. The motivation for regressing growth on leads and lags of the currency dummy variables is to retrieve information on what is happening before and after the currency crash.

In equation (1), a negative relationship between the GDP growth rate ($g_{i,t}$) and inflation rate ($Infla_{i,t}$) is expected ($\delta \prec 0$). Theoretically, the overall effect of devaluations on output is contingent on whether depreciation occurs along with rising inflation or not. The stimulating impact of devaluation on export price competitiveness (and on domestic demand for locally produced goods) is expected to foster growth, whereas higher import prices (and upward pressures on export prices and profit margins in the export sector) are expected to induce higher domestic costs, and therefore, higher inflation. A rise in domestic inflation may partly offset any price competitiveness gains arising from the devaluation (by raising costs). Also rising inflation can adversely affect domestic demand and output. The

studies by Forbes (2002), Tover (2010), and Bussière et al. (2012) apply a similar methodology.

4. Data and Data Transformation

The sample covers six Asian countries (Indonesia, Iran, Malaysia, Pakistan, South Korea, and Turkey) over the yearly period of 1980 to 2012. The data, the nominal GDP, nominal exchange rate, GDP-deflator, and CPI, is collected from WDI. For analysis, the sample is divided to three groups: Group1 (Iran, Pakistan, and Turkey), Group2 (Indonesia, Malaysia, and Korea), and Group3 (all six economies).

The GDP growth rate and inflation rate are calculated using the real GDP and CPI (2005, as a base year). A large currency collapse is defined if the annual change of nominal exchange rate in any given year is in the top quartile of all the episodes in the sample in which there is a relative loss in the currency value. The definition excludes appreciation episodes (Bussière et al., 2012). Table.2 summarizes the descriptive statistics of GDP growth rate and inflation rate variables. Table.3 displays the number of exchange change collapses in each country over the period of 1980- 2011.

Table.2 shows that the lowest (highest) mean value of GDP growth rates among six economies corresponds to Iranian (Korean) economy and it is about 3.14% (6.04%). The highest (lowest) value of coefficient of variation (CV) is about 2.03 (0.44) and it belongs to Iranian (Pakistan) economy. The lowest (highest) mean value of inflation rate is 3.12% (48.01%) and it is related to Korean (Turkey) economy. The lowest (highest) CV value of inflation rate is 0.44 (1.00) and it belongs to Iranian (Korean) economy. Table.2 also shows that the overall mean value of GDP growth rate and inflation rate of six economies are 5.01% and 15.87%. It is observed that the lowest inflation rate and the highest GDP growth rate on average belong to group 2 economies, Indonesia, Malaysia, and Korea.

Table 2: Descriptive Statistics

	GDP Growth Rate			Inflation Rate		
	IR	**PAK**	**TUR**	**IR**	**PAK**	**TUR**
Mean	0.031440	0.050409	0.042536	0.193450	0.086029	0.480139
Median	0.035272	0.049612	0.051504	0.181476	0.083795	0.466710
Maximum	0.136878	0.102157	0.094855	0.496560	0.202861	1.101732
Minimum	-0.132296	0.010144	-0.056975	0.043893	0.029141	0.062510
Std. Dev.	0.062933	0.021841	0.045075	0.084735	0.039395	0.305568
Skewness	-0.541048	0.146828	-0.877789	1.345675	0.645089	0.211247
Kurtosis	3.374655	2.505657	2.654281	6.345094	3.536412	2.073104
Jarque-Bera	1.639121	0.440811	4.268763	24.57735	2.603060	1.383518
Probability	0.440625	0.802193	0.118318	0.000005	0.272115	0.500695
	IND	**MAL**	**KOR**	**IND**	**MAL**	**S_KOR**
Mean	0.054949	0.059796	0.060368	0.105227	0.031230	0.056107
Median	0.061045	0.065402	0.065324	0.088970	0.028870	0.040335
Maximum	0.090847	0.100027	0.111041	0.583871	0.097000	0.287001
Minimum	-0.131267	-0.073594	-0.068545	0.037200	0.002900	0.008114
Std. Dev.	0.039831	0.039016	0.038286	0.094632	0.020137	0.055575
Skewness	-3.316451	-1.648597	-1.323036	4.236811	1.103504	3.024865
Kurtosis	16.13559	5.799262	5.406919	21.88134	4.844128	12.12240
Jarque-Bera	288.7189	24.94315	17.05994	571.0764	11.02892	159.7565
Probability	0.000000	0.000004	0.000197	0.000000	0.004028	0.000000
Observations	32	32	32	32	32	32

	Group1: IR, PAK, TUR		**Group2: IND, MAL, S_KOR**		**Group3: Six Economies**	
	GDP Growth Rate	**Inflation Rate**	**GDP Growth Rate**	**Inflation Rate**	**GDP Growth Rate**	**Inflation Rate**
Mean	0.041675	0.253206	0.058371	0.064188	0.050111	0.158697
Median	0.049082	0.144063	0.063086	0.047376	0.057405	0.085720
Maximum	0.136878	1.101732	0.111041	0.583871	0.136878	1.101732
Minimum	-0.132296	0.029141	-0.131267	0.002900	-0.132296	0.002900
Std. Dev.	0.046169	0.247552	0.038713	0.070835	0.043269	0.204829
Skewness	-1.014820	1.628189	-2.130018	4.684122	-1.467430	2.447690
Kurtosis	4.928667	4.901555	9.611654	32.39967	6.312157	8.919196
Jarque-Bera	30.70351	56.87961	247.4475	3808.418	155.0383	472.0130
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	96	96	96	96	192	192

Source: Author's calculation.

Table 3: Number of Exchange Rate Change Collapses (1980-2011)

Period	IR	PAK	TUR	IND	MAL	S_KOR
1980-1989	4	4	3	2	4	1
1990-1999	2	3	7	1	2	2
2000-2011	4	3	1	--	1	2
1980-2011	10	10	11	3	7	5
Rank	1.5	1.5	1	6	4	5

Source: Author's finding

Table.3 shows the number of exchange rate change collapses. Among six economies, Turkey with 11 times exchange rate change collapses ranks 1 whereas Indonesia with 3 times ranks 6 and its economy stands at lowest number of collapses.

5. Results

The literature of contractionary devaluations has for the most part used least squares estimation techniques on levels from pooled cross-section and time series data. However, these studies can still suffer from the so-called spurious regression problem, which necessitates the use of panel regression analysis. Applying the principles of the Engle and Granger (1987) methodology on pooled data, when the variables are integrated of equal degree, any OLS-based estimates of the cointegrating vector are consistent. Therefore, the integrating property of each panel variable is examined by means of employing one of several panel unit root tests. Their most prized feature perhaps is the degree of homogeneity that they allow. A test by Levin and Lin (1992) allows for heterogeneity of the intercepts across members of the panel, a more recent test by Im, Pesaran, and Shin (1997) allows for heterogeneity in intercepts as well as in the slope coefficients. Similar adjustments become necessary when the test is applied to the residuals of a model like equation (1) with multiple regressors.

Table.4 displays the variable panel unit root tests applying different test methods. All three test methods show that variables are stationary and do not have unit roots. Table.5 also shows the estimated residual in equation (1) has a stationary property to confirm a cointegrating regression.

Table 4: Variable Panel Unit Root Tests

Variable	Method	Group 1 Statistics	Group 1 Prob.*	Group 2 Statistics	Group 2 Prob.*	Group 3 Statistics	Group 3 Prob.*
GDP Growth Rate	Levin, Lin & Chu	-2.4896	0.0064	-2.8380	0.0023	-3.7496	0.0001
	ADF- Fisher Chi-square	19.1035	0.0040	15.7919	0.0149	34.8954	0.0005
	PP-Fisher Chi-square	32.9846	0.0000	16.4494	0.0115	49.4340	0.0000
Inflation Rate	Levin, Lin & Chu t	-2.1882	0.0143	-5.2701	0.0000	-4.6274	0.0000
	ADF- Fisher Chi-square	10.5449	0.1035	35.1636	0.0000	45.7085	0.0000
	PP-Fisher Chi-square	10.6260	0.1006	34.3581	0.0000	44.9841	0.0000

* Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality; ADF - Fisher and PP - Fisher - Null Hypothesis: Unit Root (Individual Unit Root process). Levin, Lin & Chu Test - Null Hypothesis: Unit Root (common Unit Root process) Automatic lag length selection based on Modified Schwarz Criteria and Bartlett kernel.

Table 5: Residual Stationary Test

Method	**Group1 Stat.***	**Group2 Stat.***	**Group3 Stat.***
Levin, Lin & Chu	-8.06	-6.46	-9.49
ADF- Fisher Chi-square	60.46	45.81	98.08
PP-Fisher Chi-square	56.74	45.11	99.78

*All values are at 1% level of significant.

Table 6: Estimation Results

	Group 1		Group 2		Group 3	
	Coeff.	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**
Collapse$_{t-3}$	-	-	0.012178	1.594861		
	0.002127	0.176255			0.003529	0.479111
Collapse$_{t-2}$	0.000221	0.017611	0.005580	0.662004	0.006729	0.919171
Collapse$_{t-1}$	0.007924	0.646439	-0.020553	-2.199656**	0.006950	0.928419
Collapse$_{t}$	-	-	-0.021963	-2.873150***		
	0.007912	0.580634			-0.019011	-2.420865*
Collapse$_{t+1}$	0.017505	1.429153	-0.022532	-2.813875***	0.007027	0.939141
Collapse$_{t+2}$	0.014092	1.073298	-0.018064	-2.246748**	0.000489	0.062248
Collapse$_{t+3}$	0.006963	0.474946	-0.014051	-1.645030	0.004067	0.492441
Inflation	-	-	-0.141667		-	-2.900909***
	0.066984	1.298543			0.0	
					842	
				-3.16331***	02	
Constant	0.049830	4.182***	0.080		0.0	10.73284***
			257		632	
				16.78057***	93	
R-squared	0.476057		0.911157		0.497699	
F-stat.	1.090323		12.30703		3.050739	
F-Prob.	0.391433		0.000000		0.000002	
DW	1.640148		1.429807		1.544137	
Observation	78		78		156	
Countries	3		3		6	

*** 1%, **5%, and *10% levels of significant.

Applying two-way fixed effects panel regression, the estimation results of currency collapse is summarized in Table 6.[1] The coefficient of inflation rate variable has a correct expected sign theoretically, higher inflation reduces real GDP growth rate. The estimated coefficients are statistically significant in groups (2) and (3) but not statistically significant in group (1).

1- The rest of estimation results are excluded to save space.

On average, controlling inflation rate by one point, the growth rate changes in opposite direction by about 0.08 point in whole sample economies.

Table.6 shows that the current currency crash has a negative effect on economic growth on all groups but this effect is not statistically significant for group (1), Iran, Pakistan, and Turkey. Large currency devaluation has moderate and statistically significant contractionary effects on growth one and two years before and after the currency crash, time t, in group (2) economies, Indonesia, Malaysia, and Korea. For this group, an aspect worth highlighting is that the estimates suggest that growth experiences a slowdown one year prior to the currency collapse and two years after the currency collapse, and on average it remains negative for these economies. In other words, we do find evidence suggesting that currency collapses are on average contractionary for some sample Asian economies. The results further confirm the V shape effect of currency devaluation on economic growth of groups (1) and (2) countries observed by Milesi-Ferretti and Razin (1998) regarding to other developing economies.

6. Conclusion

Applying two-way fixed effects panel econometric model over the period 1980-2011 aiming to find the effects of currency collapses in six Asian economies, the estimation shows the following results:

1- The coefficient of inflation rate, as a control policy variable, shows higher inflation decreases in real GDP growth rate in whole countries; however, its effect is statistically significant on Indonesian, Malaysian, and South Korean economies. On average, controlling inflation rate by one point, the GDP growth rate is expected to change by about 0.08 point in opposite direction in whole sample economies. When the sample economies are subdivided to two groups, Iran, Pakistan, and Turkey versus Indonesia, Malaysia, and South Korea,

the effect of inflation control is much higher (about 0.12) in the latter group.

2- The currency crash has a negative effect on economic growth on grouped samples economies, its effect is not statistically significant for the group of Iran, Pakistan, and Turkey compared to the second group, Indonesia, Malaysia, and South Korea, and the whole group of six economies.

3- A large currency devaluation has moderate and statistically significant contractionary effects on growth, one and two years before and after the currency crash time t, in Indonesian, Malaysian, and Korean economies. For this group, the estimates suggest that growth experiences a slowdown one year prior to the currency collapse and two years after the currency collapse, and on average it remains negative for these economies.

Overall, we do find evidence suggesting that currency collapses are on average contractionary for some sample Asian economies.

Policy implication study is clear. The policymakers of six Asian economies should avoid a large currency devaluation to prevent its contractionary effect on economic growth.

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