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Exploring the Dynamic Effects of Equity-Based Capital Inflows in BRINCS countries

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Abstract

This study investigates whether equity-based capital inflows have influences on short-run macroeconomic variables. Using a structural VAR model, the study estimates the response of output gap, inflation, exchange rate, and interest rate and foreign exchange reserves to an exogenous shock to equity-based capital inflows. Its findings reveal that an exogenous increase in equity-based capital inflows has effect on inflation and interest rate but no influence on output gap, exchange rate etc. Thus, the short-run macroeconomic effects of exogenous capital inflows are partially attributed to changes in equity-based capital inflows.

Keywords: capital inflows, structural VAR, output gap

1. Introduction

Most countries in Africa have experienced a continuous decrease in capital inflows over the recent years. Many research identify the excessive macroeconomic volatility in the region to a significant decline in capital inflows while other studies suggest the need for policy measures to stimulate capital inflows and diversify the channels through which the capital flows into the region (International Monetary Fund, 2012). Studies such as Forbes and Warnock (2012), Fratzcher (2012) and Rey (2013) consider global liquidity and risk as the major drivers of capital inflows. They postulated that "global push factors" exercise more important effect on capital flows into a country than any country-specific "pull factors". Milesi-Ferretti and Tille (2011) and Lane and Milesi-Ferretti(2012) utilized a disaggregated dataset to find that bank loans and other types of debt-based capital flows exhibit the largest fluctuations over the past few years. Similarly, Forbes and Warnock (2014) reveal that global push factors mainly influence both debt-and equity-based capital inflows but their effects

are stronger for the case of debt flows (entails bank loans and portfolio debt flows). Equity which composes portfolio equity flows

and foreign direct investment (FDI) is significantly attached to a country –specific features of the receiving country.

Owing to the fact that substantial share of capital inflows are triggered by the global push factors, this study intends to empirically quantify the impacts of these capital inflows on macroeconomic and financial situations in the receiving country. As different channels of capital inflows are influenced by different factors, it is more interesting to investigate whether different types of capital inflows exhibit different impact on these same macroeconomic and financial variables.

This study employs a structural VAR with the purpose of identifying the exogenous shock to capital inflow as suggested in Stock and Watson(2012), Mertens and Ravn(2013) and Gertler and Karadi(2015). This entails a two-step procedure in identifying the part of capital inflows that are exogenous from the view of the recipient country, and this is employed to measure the impulse response of various macroeconomic variables.

Its findings reveals that exogenous rise in equity-based capital inflows influences inflation and interest rate. However, these macroeconomic influences of equity capital inflows are not pronounced on foreign exchange reserves and exchange rate.

This study is partly similar to the previous studies that analyze the macroeconomic effects of global capital inflows. For example, Reinhart and Reinhart (2009) concluded that a surge in capital inflows causes a rise in inflation and exchange rate appreciation. Caldarella et al. (2010) provided the same results when analyzing a group of both emerging and advanced economies. Justiniano et al. (2014) found that the increase in house prices and household debt in the United States is majorly driven by the capital inflows. Similarly, Sa et al. (2014) revealed the similar results for OECD countries, and Tillmann (2013) indicates the validity for the case of Asian emerging market economies. Aizenmanand Jinjarak (2014) identified the current account deficit as the second key driver of real estate price appreciation when using a panel dataset of 36 countries over the last decade.

Furthermore, numerous studies that focus on emerging market and developing countries have indicated that a surge in capital inflows triggers a rise in credit growth (see Kaminsky and Reinhart, 1999; Kaminsky et al.,

2005; Magud et al., 2011; Mckinnon and Pill, 1996; Mendoza and Terrones, 2008; 2012; Reinhart and Rogoff, 2011).

Frankel and Rose (1996) utilized an annual panel dataset of over 100 developing countries. Their result indicates that a small share of foreign direct investment (FDI) in total capital inflows can account for a currency crash. In the same vein, Calderon and Kubota (2005) examined the influence of disaggregated capital flows on the likely occurrence of a crisis. They discovered that debt-based capital inflows lead to crises, but FDI reduces the credit boom (and thus a crisis) accompanying a surge in capital inflows.

Aizenman et al. (2010; 2011) revealed that portfolio flows and debt flows are responsible for increased output volatility, but the reverse is for FDI flows. Jongwanich and Kohpaiboon (2013) considered the composition of capital inflows as the major channel through which flows affect real exchange rates. In addition, portfolio investment are connected with faster exchange rate appreciation than FDI flows.

Lane and McQuade (2014) indicate that debt inflows strongly determine domestic credit growth but no impact from equity flows, when empirical analysis was conducted on European countries as well as advanced and emerging market economies, before the recent crisis.

Tong and Wei(2011) employed firm level data and found that credit crunch during the recent crisis poses a more impact on firms whose working capital is financed externally. More so, the overreliance on non-FDI capital inflows before the crisis exacerbates the credit crunch during the crisis, while exposure to FDI relaxes the liquidity constraint. However, for the purpose of this study, the equity-based capital inflows are employed.

This study will continue as follows: Section 2 describes data and econometric model employed to analyze the impact of equity-based capital inflows on macroeconomic and financial variables, while Section 3 presents the results in which impulse responses to the effect of a shock to equity-based capital inflows on various macroeconomic variables. The robustness of these results are discussed in Section 4. Section 5 is conclusion.

2. Data and Econometric model

This study examines the impulse responses by utilizing the following structural vector autoregressive (VAR) model with the aim of identifying the macroeconomic influences of exogenous changes in capital inflows:

$$\beta_0 Y_{jt} = \beta(L) Y_{jt-1} + \varepsilon_{jt} \qquad 1$$

Where Y_{jt} entails nine rows corresponding to the variables: equity capital inflows (TI_{jt}), the output gap (OG_{jt}), the inflation rate (π_{jt}), the change in the exchange rate (dEX_{jt}), the level of the short-term nominal interest rate (i_{jt}), and the change in the stock of foreign exchange reserves (RES_{jt}) in country j at time t.

The time series of Y_{jt} for each country j is pooled across the BRINCS countries in order to determine common estimates of the structural VAR matrices $\beta.\varepsilon_{jt}$ comprises structural white-noise shocks where $E_j\left(E_j\left(\varepsilon_{jt}\,\varepsilon'_{jt}\right)\right)$ simply refers to the identity matrix.The optimal lag length is selected using the Schwartz Info Criterion (SIC) in the VAR specification.

2.1 Exogenous Shocks to capital inflows

Impulse responses and variance decompositions are calculated from the equation 1 in order to quantify the macroeconomic effects of exogenous changes to equity-based capital flows. The structural VAR is transformed into a reduced VAR by multiplying both sides by$\beta_{jt}{}^{-1}$:

$$Y_{jt} = A(L) Y_{jt-1} + u_{jt}$$

$where\ \sum = E_j\left(E_t\left(u_{jt}\,u'_{jt}\right)\right) = SE_j\left(E_j\left(\varepsilon_{jt}\,\varepsilon'_{jt}\right)\right)S' = SS',\ and\ S = S = \beta_0{}^{-1}.$ $A(L)$ and Σ are computed by pooling the time series across the N countries in the study.

The study imposes a certain ordering variables with the aim of identifying S through a Cholesky decomposition of Σ in line with a recursive identification strategy. For example, if capital inflows are considered first in the Cholesky ordering, the assumption implies that shocks to the other variables in the model pose no impact on contemporaneous capital inflows. Hence, any innovations in capital inflows has to be exogenous shocks to capital inflows (captured in the first part in the vector,u_{jt}). However, this assumption

of no influence on contemporaneous shocks is too strong. Therefore, the study inculcates external instruments into a structural VAR as discussed by Stock and Watson (2012), Mertens and Ravn (2013) and Gertler and Karadi (2015). This is regarded as a two-step procedure. The first is to employ a set of exogenous instruments

to determine part of the reduced form innovations to capital inflows, and then investigate the response of the reduced form innovations to the other variables in the model, to variations in the exogenous component of capital flows. Based on this approach, the first column in the matrix S is determined in the specification where equity-based capital inflows are considered.

In order to estimate the reduced version of the structural VAR model in 2, the study calculates the residuals from the capital inflows equation in the reduced VAR. In the first model specification that entails equity-based capital inflows, time series ${u_{jt}}^{EI}$ is the first row of the vector of residualsu_{jt}. I

Z_t denotes a set of external instruments that have a correlation with shocks to capital inflows but no correlation with shocks to any of the other variables in the model.Z_t is common across all countries, and thus it has no a country subscript j:

$$E_t\left(Z_t {u_{jt}}^p\right) \neq 0 \; for \; p = TI, DI, EI$$

$$E_t\left(Z_t {u_{jt}}^q\right) \neq 0 \; for \; q = O, OG, \pi, dEX, dSP, dCRE, i, RES$$

Based on the first stage regression, ${u_{jt}}^p$ is regressed on Z_t after pooling the time series of the residuals ${u_{jt}}^p$ across all N countries and compute the fitted values ${\hat{u}_{jt}}^p$. Then ${u_{jt}}^q$ is regressed on ${\hat{u}_{jt}}^p$ in the second stage of the same pooled regression:

$${u_{jt}}^q = \frac{S^q}{S^p}{\hat{u}_{jt}}^p + \epsilon_{jt} \qquad 3$$

This stage produces a consistent estimate of $\frac{S^q}{S^p}$ where S^q represents the value in the qth row of the matrix S. in the aggregate specification (p=EI), S^q is in the first column of S. The value S^p denotes the average standard deviation of ${u_{jt}}^p$ where p= EI. To finalize the identification, the assumption is that exogenous shocks to equity-based inflows poses a threat to stability. Hence, the element in the first-row-second column

and the element in the second row-first column are both set to zero in order to complete the first two columns of the matrix S.

2.1.1. Variables and Data

Data on capital inflows are obtained from the IMF's balance of payment statistics. This study utilizes a quarterly dataset for the sample period, 1997-2015 for BRINCS countries. The balance of payment statistics divides capital inflows into four components: foreign direct investment (FDI), portfolio equity, portfolio debt and other which entails bank lending. This study sums FDI liabilities and portfolio equity liabilities to form equity-based capital inflows, the equity-based capital inflows are normalized by a country's nominal GDP.

The variables used to capture the matrix Y_{jt} of country-specific economic and financial variables in the model are the output gap (measured as the deviation of real GDP from its HP filtered trend); inflation; change in the exchange rate (domestic currency per SDR); the level of the short-term nominal interest rate, and the change in the stock of foreign exchange reserves, normalized by nominal GDP.

3. Results and Discussions

3.1 Descriptive Analysis

Table 1 presents the mean, standard deviation and first-order autocorrelation for each of the concerned variables in the model. As indicated in the table, the mean of the equity-based capital inflows (LINFLOW) is about 72% of GDP per year. In addition, its first order autocorrelation is about 0.59.

Table 1:Summary Statistics

Variable	Mean	Std. Dev.	1st Order autocorrelation
INFL	8.19	8.82	0.49
LGDPGAP	27.74	0.90	1.00
LINFLOW	0.72	0.69	0.59
LRESV	25.22	1.70	0.90
LRIR	2.07	1.13	0.78
LREER	4.49	0.25	0.66

Source: Author's computation

The unconditional correlation among the concerned variables is reported in Table 2. The table indicates that equity-based capital inflows are less likely to be associated with macroeconomic variables such output gap (LGDPGAP), inflation (INFL), nominal interest rate(LRIR) and exchange rate (LREER).

Table 2: Correlation coefficients

Correlation	INFL	LGDPGAP	LINFLOW	LRESV	LRIR	LREER
INFL	1.00					
LGDPGAP	-0.42	1.00				
LINFLOW	-0.23	0.42	1.00			
LRESV	-0.44	0.76	0.34	1.00		
LRIR	0.09	0.11	0.26	-0.15	1.00	
LREER	-0.24	0.03	0.00	0.11	-0.09	1.00

Source: computed by author

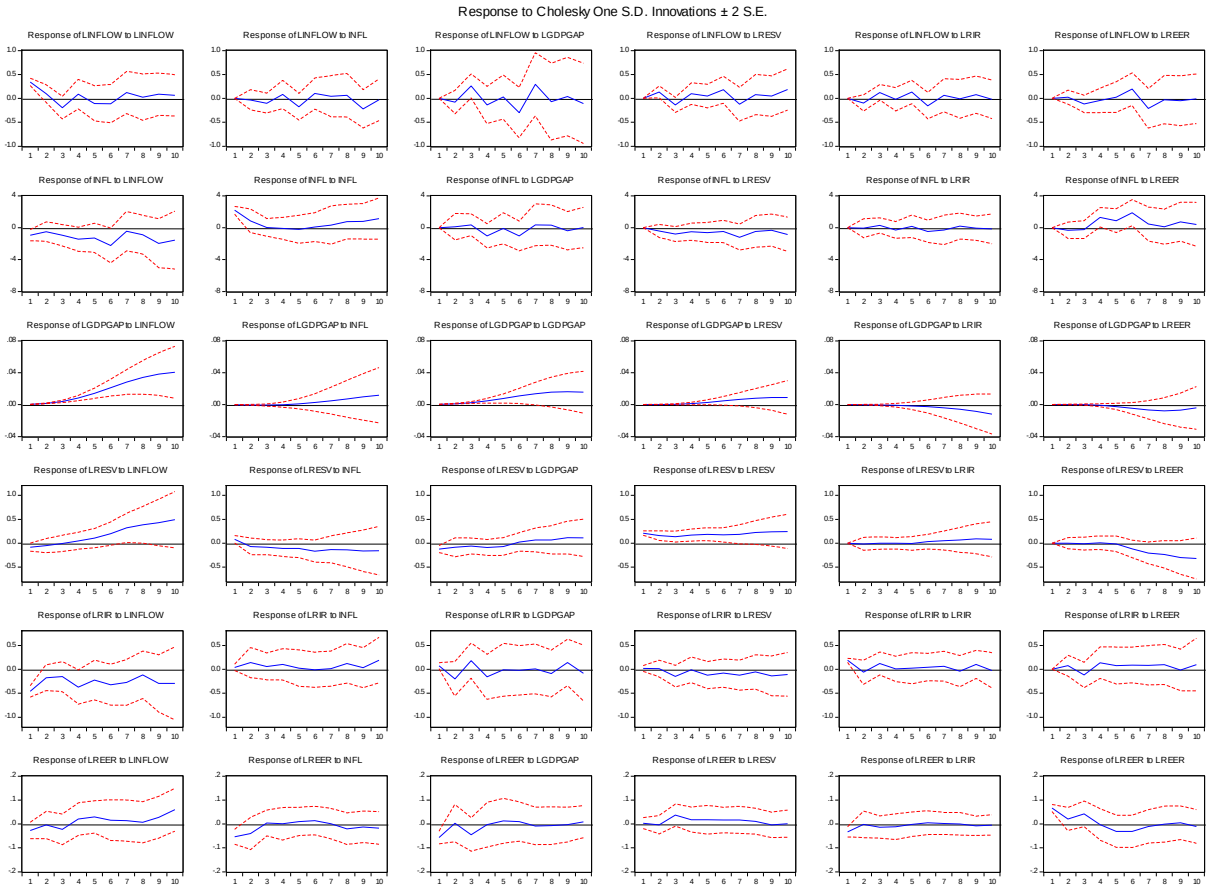
3.2 Impulse Response

The response of macroeconomic variables to an exogenous 1 percentage point rise in the equity-based capital inflows (LINFLOW) are illustrated in Fig. 1. Using the five criteria in choosing the optimal lag length in this VAR, the lag length that minimizes is 5(see Table 3). The figure indicates that a 1 percentage point increase in equity-based capital inflows leads to a significant fall in inflation at the first of the covered period but insignificant decline in the subsequent years. However, the responses of output gap to an exogenous to equity inflows are insignificant in the first three years of the covered period. Its responses are positively significant after the third year. In the same vein, there is an insignificant responses from foreign exchange reserves and exchange rate, while responses of nominal interest rate is significant.

Table 3:VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-585.848	NA	0.750456	13.90231	14.04599	13.96010
1	-252.249	620.1025	0.000528	6.641142	7.503254	6.987908
2	-59.7167	335.2320	1.03e-05	2.699216	4.279755	3.334953
3	60.53689	195.2352	1.11e-06	0.457956	2.756922	1.382664
4	147.2710	130.6114	2.68e-07	-0.99461	2.022781	0.219068
5	228.1312	112.2530*	7.56e-08*	-2.308970*	1.426849*	-0.806319*

Figure 1: Impulse Response



3.3 Variance decompositions

The study calculates variance decomposition from the impulse response analysis in order to identify the contribution of exogenous shocks to equity-based capital inflows to the variance of macroeconomic variables. The findings from the variance decompositions are reported in Table 4. In addition, the results presented in the table emanated from the pooled sample of 6 countries (BRINCS). The variance decompositions are

subjected to 10 year forecast horizons. Shocks to equity capital inflow account for about 6- 72 percent of the forecast error variance of the output gap (LGDPGAP), inflation (INFL), exchange rate (LREER), nominal interest rate (LRIR) and foreign exchange reserves (LRESV). The result of SVAR estimation is presented in the appendix (Table A.1)

Table 4: Result of Variance Decomposition

Variance Decomposition of LINFLOW:							
Period	S.E.	LINFLOW	INFL	LGDPGAP	LRESV	LRIR	LREER
1	0.342649	100	0	0	0	0	0
2	0.403631	78.22292	0.652326	3.762841	11.08036	5.944412	0.337139
3	0.572188	50.72033	3.401664	22.52159	11.28594	7.68473	4.385738
4	0.610354	46.64584	4.756985	24.99709	12.38019	6.844083	4.37582
5	0.661008	42.40116	11.29482	21.48569	11.0574	9.878494	3.882439
6	0.80236	30.72851	9.262892	28.5108	12.48644	10.44519	8.566165
7	0.899772	26.29312	7.603643	33.29215	11.75525	8.830649	12.22518
8	0.909018	25.82691	7.939363	33.21171	12.28348	8.669261	12.06929
9	0.945697	24.70169	12.7584	30.84157	11.59567	8.66115	11.44153
10	0.972327	23.77475	12.16405	30.35956	14.62329	8.244167	10.83417
Variance Decomposition of INFL:							
Period	S.E.	LINFLOW	INFL	LGDPGAP	LRESV	LRIR	LREER
1	2.380015	15.83125	84.16875	0	0	0	0
2	2.633036	16.45898	79.10608	0.204657	2.537105	0.067139	1.626041
3	2.956531	23.31548	62.75301	1.644916	9.440914	0.924374	1.921303
4	3.738206	29.71614	39.30498	8.703859	7.823905	1.237148	13.21397
5	4.105844	34.48222	32.84496	7.255359	8.739551	1.198426	15.47948
6	5.188822	40.27362	20.584	8.5943	6.346319	1.543924	22.65784
7	5.39331	37.96666	19.39467	8.399861	10.8032	1.728695	21.70692
8	5.552252	38.37887	20.1468	8.259662	10.93736	1.751562	20.52575
9	6.010753	43.45272	18.92028	7.474781	9.606549	1.509078	19.03659
10	6.38284	44.44129	19.99324	6.629107	10.25857	1.393664	17.28413
Variance Decomposition of LGDPGAP:							
Period	S.E.	LINFLOW	INFL	LGDPGAP	LRESV	LRIR	LREER
1	0.000448	46.12737	12.95641	40.91621	0	0	0

2	0.001856	60.26797	6.765139	32.07724	0.148284	0.56294	0.178422
3	0.005005	68.03801	2.138646	28.14134	0.807504	0.828837	0.04567
4	0.010773	71.60681	0.481663	24.57848	1.76415	0.930637	0.638255
5	0.019766	72.39286	0.338077	21.95933	2.555175	0.958234	1.796326
6	0.031835	72.21946	0.776917	19.93805	3.135453	1.03855	2.891571
7	0.046081	71.93269	1.444109	18.31748	3.52868	1.236425	3.540608
8	0.061187	71.90532	2.214135	16.88129	3.753699	1.633251	3.612303
9	0.075944	72.13004	3.031065	15.52118	3.802409	2.321338	3.193968
10	0.089507	72.33117	3.875789	14.1634	3.692009	3.4201	2.517536
Variance Decomposition of LRESV:							
Period	S.E.	LINFLOW	INFL	LGDPGAP	LRESV	LRIR	LREER
1	0.271593	9.29614	9.513306	20.42028	60.77027	0	0
2	0.337629	8.307718	10.17147	19.67345	61.65242	0.19479	0.000151
3	0.378723	6.61611	13.07506	18.06711	62.03319	0.157456	0.051078
4	0.440953	6.168267	15.76405	17.32123	60.55002	0.117614	0.07882
5	0.506763	9.044278	16.31531	15.00187	59.40546	0.108564	0.124527
6	0.608471	16.94471	18.72813	10.58923	49.41199	0.363101	3.962836
7	0.757121	28.79703	15.09759	7.623234	37.91597	0.7639	9.80228
8	0.924291	36.6404	12.38747	5.688329	31.21802	1.035606	13.03017
9	1.112029	40.40309	10.6377	5.025728	26.2485	1.413295	16.27169
10	1.297539	44.01642	9.240535	4.42822	22.8677	1.425361	18.02176
Variance Decomposition of LRIR:							
Period	S.E.	LINFLOW	INFL	LGDPGAP	LRESV	LRIR	LREER
1	0.505823	82.83177	0.684506	2.24408	0.129724	14.10992	0
2	0.596834	68.28813	6.043958	12.69793	0.168533	11.14929	1.652157
3	0.682515	57.18623	5.42666	16.71949	4.679799	11.6871	4.30072
4	0.811679	61.47308	5.455134	15.48475	3.323242	8.273543	5.99026
5	0.855256	62.25091	5.007399	13.95695	5.037497	7.523395	6.22385
6	0.922632	65.5622	4.316421	12.04472	5.055338	6.7179	6.303414
7	0.97572	66.46542	3.876661	10.77826	6.072908	6.440837	6.365914
8	1.00149	64.43741	5.212678	10.99816	6.071567	6.258709	7.021481
9	1.067827	64.23853	4.676976	11.4701	6.987568	6.435564	6.19126
10	1.136953	63.39162	7.017541	10.62481	7.022507	5.725286	6.21824
Variance Decomposition of LREER:							
Period	S.E.	LINFLOW	INFL	LGDPGAP	LRESV	LRIR	LREER

1	0.111085	6.251732	23.16178	25.9539	0.090632	8.962096	35.57986
2	0.120093	5.464866	30.93243	22.26587	0.167029	7.690518	33.47929
3	0.142249	6.440263	22.12653	25.71159	6.793942	6.360957	32.56672
4	0.145321	8.102255	21.20346	24.68717	8.02853	6.745236	31.23335
5	0.153267	10.93479	19.49336	22.8823	8.48614	6.075969	32.12745
6	0.159043	11.18088	18.84194	21.61422	8.919238	5.738732	33.70499
7	0.16109	11.61789	18.37367	21.35192	9.766409	5.612022	33.2781
8	0.163034	11.50709	19.49149	21.04108	9.988019	5.479488	32.49283
9	0.166196	13.8668	19.31975	20.2868	9.673725	5.506404	31.34652
10	0.177899	23.19403	17.79517	17.96892	8.446973	4.869558	27.72534
Cholesky Ordering: LINFLOW INFL LGDPGAP LRESV LRIR LREER							

4. Concluding Remarks

This study finds that exogenous shocks to equity-based capital inflows have a significant influence on macroeconomic variables. It is frequent news and debates on how shocks to capital inflows influence macroeconomic variables like inflation, output, and exchange rate. The panel VAR analysis in this study indicate the evidence of the reality. However, this paper narrowly focuses on the macroeconomic-effects of equity capital inflows. Its findings reveal that equity capital inflows have significant influence on inflation and nominal interest rate.

The rationale behind the irrelevant macroeconomic effect of equity-based capital inflows has been a great concern among researchers and policymakers. In addition, a huge component of capital inflows can be regarded as exogenous from the point of view of the receiving country, and these capital inflows can trigger greater macroeconomic and financial volatility. This calls for recent research on how capital flows can be managed in the interest of macroeconomic and financial stability. However, this study indicates that equity-based inflows can pose a real threat to stability through inflation and nominal interest rate at the first period, and thus subsequently affects the output gap. Its findings reveal that equity-based capital inflows cannot be

ignored in these BRINCS countries because they also provide the real threat to stability. This is not in line with the previous studies (Davies, 2015; Kollmann et al., 2011; Ueda, 2012).

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Appendix

Table A.1: Structural VAR Estimates

	Coefficient	Std. Error	z-Statistic	Prob.
C(2)	-2.76368***	0.995207	-2.77699	0.0055
C(4)	0.000684***	0.000142	4.803681	0.0000
C(5)	-7.39E-05	2.05E-05	-3.60319	0.0003
C(7)	0.157250	0.131492	1.195885	0.2317
C(8)	0.006735	0.017376	0.387612	0.6983
C(9)	-427.978	115.3038	-3.71174	0.0002
C(11)	-1.48492	0.120045	-12.3698	0.0000
C(12)	0.038114	0.015622	2.439749	0.0147
C(13)	301.0608	119.6044	2.517139	0.0118
C(14)	0.086048	0.140154	0.613959	0.5392
C(16)	-0.27605	0.091067	-3.03132	0.0024
C(17)	-0.0325	0.005830	-5.57523	0.0000
C(18)	-137.892	44.81732	-3.07676	0.0021
C(19)	0.030856	0.049101	0.628423	0.5297
C(20)	-0.17502	0.054463	-3.21362	0.0013
C(1)	0.342649	0.037839	9.055385	0.0000
C(3)	2.183510	0.241128	9.055385	0.0000
C(6)	0.000287	3.17E-05	9.055385	0.0000
C(10)	0.211721	0.023381	9.055385	0.0000
C(15)	0.190003	0.020982	9.055385	0.0000
C(21)	0.066261	0.007317	9.055385	0.0000