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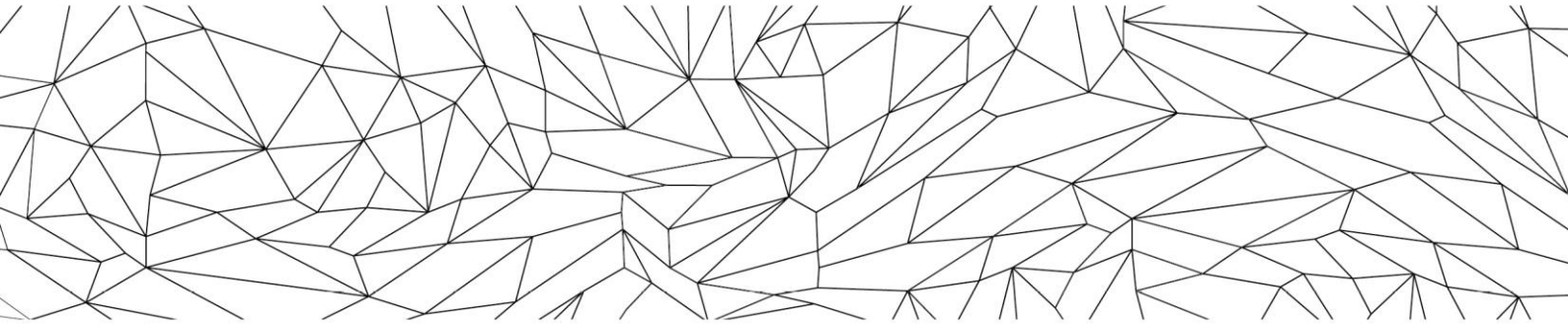

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Department of Economics
SOAS University of London
Thornhaugh Street, Russell Square, London WC1H 0XG, UK
Phone: + 44 (0)20 7898 4730
Fax: 020 7898 4759
E-mail: economics@soas.ac.uk
http://www.soas.ac.uk/economics/

Modelling Opportunity Cost Effects in Money Demand due to Openness

Sophie van Huellen[*†]

Duo Qin[†]

Shan Lu[‡]

Huiwen Wang[‡]

Qingchao Wang[†]

Thanos Moraitis[†]

Abstract

We apply a novel model-based approach to constructing composite international financial indices (CIFIs) as measures of opportunity cost effects that arise due to openness in money demand models. These indices are tested on the People's Republic of China (PRC) and Taiwan Province of China (TPC), two economies which differ substantially in size and degree of financial openness. Results show that a) stable money demand equations can be identified if accounting for foreign opportunity costs through CIFIs, b) the monetary policy intervention in the PRC over the global financial crisis period temporarily mitigated disequilibrating foreign shocks to money demand, c) CIFIs capture opportunity costs due to openness more adequately than commonly used US interest rates and d) CIFI construction provides valuable insights into the channels through which foreign financial markets affect domestic money demand.

Keywords: money demand, opportunity cost, open economy.

JEL classification: E41, F41, C22, O53

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[*] Corresponding author. Tel: +44 207 898 4543. Email: sv8@soas.ac.uk

[†] Department of Economics, SOAS University of London. Russell Square, London WC1H 0XG, UK.

[‡] School of Economics and Management, Beihang University. 37 Xueyuan Road, Beijing 100191, China PR.

1. Introduction

The lack of appropriate measures for opportunity costs in conventional money demand models is a widely acknowledged problem for empirically establishing a stable relationship between money demand and the domestic interest rate; see Calza et al. (2001). Financial deepening renders interest rate variables increasingly inadequate measures of opportunity costs that arise from speculative and precautionary motives. The problem is complicated by financial openness as opportunity costs from foreign assets must be considered alongside domestic assets. Emerging market economies that have deepened their financial sectors and heightened financial integration over recent decades are particularly vulnerable to instability in the money demand equation. This is because the increased availability of assets potentially alters the sensitivity of money holdings to domestic interest rates, undermining the interest rate as an effective policy tool; see Gurley and Shaw (1955), Poole (1970) and Darrat and Webb (1986). However, historical evidence, mainly from the US and the UK, suggests that a stable relationship can be found if adequately accounting for opportunity costs; see Friedman and Schwartz (1982) and Hendry and Ericsson (1991). Taking the People's Republic of China (PRC) and Taiwan Province of China (TPC), two export-oriented economies which differ substantially in size and degree of financial openness, as case studies, this paper develops composite international financial indices (CIFIs) as measures of opportunity costs in conventional money demand equations to test whether stability can be maintained by inclusion of such measures.

The PRC's financial opening was initiated with the establishment of the Shanghai Stock Exchange, major reforms of the banking system, and the official recognition of the money aggregate as policy target by the People's Bank of China (PBC) in the mid-1990s; see El-Shagi and Zheng (2017) and Chen and Werner (2011). Recent reforms such as the gradual and measured opening of the capital account and the abandonment of the exchange rate peg in July 2005 made the PRC more susceptible to international financial shocks (Glick and Hutchison 2009). Over the global financial crisis (GFC) period, the PBC intervened heavily by reverting to the dollar peg between November 2008 and June 2010, reintroducing strict capital controls and releasing a 4tn RMB fiscal stimulus package combined with an expansionary monetary policy (Yu 2010, Han 2012). In 2011 the PBC gradually returned to a more prudent monetary policy and the continuation of the pre-crisis liberalisation agenda achieved its goal of establishing the RMB as an international reserve currency in December 2015 (Berkelmans, Kelly and Sadeghian 2016).

Financial liberalisation started much earlier in TPC with the establishment of the Taipei Foreign Exchange Market in 1979 and the implementation of a flexible exchange rate regime in the same year (Shieh, Liu and Lee 2017). In late 2003 domestic stock markets were fully opened to foreign investors completing financial liberalisation (Wu, Lin and Tiao, et al. 2005, Lee and Chang 2008). In contrast to the PRC case the central bank of TPC did not intervene during the GFC which triggered large scale capital inflow as domestic investors retreated from international financial

markets (Wu, Lin and Peng, et al. 2014). Given the differences between the two economies in terms of financial integration and experiences during and after the GFC, we expect different conclusions in the search for an adequate measure of opportunity costs due to openness.

Increasingly interactive asset price movements across financial markets globally require empirical strategies that adequately capture those movements in money demand models. However, empirical strategies often rely on a few foreign (predominantly US) interest rate variables (and exchange rates); see Chowdhury (1995) and Calza et al. (2001). These variables are inadequate measures of the openness effects for two key reasons. First, bilateral interest rate parity conditions that underlie opportunity cost arbitrage in the money demand equation are frequently found to not hold empirically; see Froot and Thaler (1990). Second, it is precisely the interactive nature of asset prices across financial markets and the banking sector that underlies opportunity costs that arise from speculative and precautionary motives for money holding. Hence, these motives cannot be captured adequately by interest rate variables alone.

Instead of relying on interest rate variables from few individual economies, we suggest constructing country specific CIFIs as aggregate measures of international opportunity costs that arise from a broad set of foreign financial markets. CIFIs are inspired by a wider literature that addresses the construction of financial condition indices (FCIs) to be used as measures of financial market conditions in macroeconomic models. FCIs are commonly constructed by principle component-based (PC-based) factor analysis following the seminal work of Stock and Watson (1990, 2002). However, PC-based FCIs suffer from the lack of concatenation operation, the imposition of synchronised dynamics among financial input variables, and the inability to capture country specific effects; see Qin et al. (2018a) for a literature review and discussion. Evading these shortcomings, Qin et al. (2018a) propose a novel algorithmic modelling approach to FCI construction that imposes concatenation operation as a fundamental measurement property, provides for dynamic dis-synchronisation among input indicators and employs unsupervised and supervised learning methods for a country (target) specific index construction. We adapt this novel approach for CIFI construction to augment conventional money demand models.

Our choice of input indicators for CIFI construction is guided by the existing literature that addresses opportunity cost in money demand equations. Friedman and Schwartz (1982) argue for the inclusion of money, stock and bond markets. Friedman (1988) and also Choudhry (1996) show that money demand equations that exclude stock market prices are mis-specified. McNown and Wallace (1992) further demonstrate the importance of including exchange rates. Since the GFC, banking sector characteristics such as ease of credit and risk perception have increasingly been recognised for their role in money demand (Gambacorta and Marques-Ibanez 2011). These considerations are also reflected in the more recent empirical literature that investigates money demand for the economies of TPC and the PRC, see for

instance Wu et al. (2005, 2014) and Shieh et al. (2017) on TPC and Baharumshah et al. (2009) on the PRC. Following this literature, we include input indicators from stock, foreign exchange, futures, bond and money markets and the banking sector.

Our key findings can be summarised in four points: a) Stable money demand models can be found if accounting for foreign opportunity costs through CIFIs during times of financial openness. b) The PBC's policy intervention over the GFC period temporarily mitigated disequilibrating foreign shocks to money demand. c) CIFIs capture opportunity costs due to openness more adequately than US interest rates. d) CIFI construction provides valuable insights into the channels through which foreign financial markets affect domestic money demand.

The remainder of the paper is structured as follows. The next section outlines a money demand model that accounts for opportunity cost effects due to openness in the form of latent variables. The next section also outlines the algorithm for the construction of CIFIs as measures for these latent variables. The third section presents and discusses empirical results for the economies of the PRC and TPC. The fourth section concludes with some consideration of methodological implications.

2. Method and Data

We start from a standard money demand equation with M being narrow money (M1), R being domestic interest rate or opportunity costs for holding money balance and Y being economic expenditure or output approximated by GDP:

$$M = f(Y, R) \tag{1}$$

In an open economy context, foreign opportunity costs R^* arise alongside domestic costs due to the possibility of domestic investors investing abroad or foreign investors investing domestically. If $Cov(R, R^*) \neq 0$, the omission of R^* from (1) results in a biased estimate of the sensitivity of money demand to the domestic interest rate R. Amending (1) accordingly yields (2).

$$M = f(Y, R, R^*) \tag{2}$$

Following the seminal work of Hendry and Ericsson (1991), we choose an error correction model (ECM) as the model form for (1), with $m_t = \ln(M_t)$ and $y_t = \ln(Y_t)$ as our baseline model:

$$\begin{aligned} \Delta m_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \, \Delta m_{t-i} + \sum_{i=0}^{q} \beta_i \, \Delta y_{t-i} + \sum_{i=0}^{q} \theta_i \, \Delta R_{t-i} - \gamma e_{t-1} + u_t, \\ e_{t-1} = m_{t-1} - k_1 y_{t-1} - k_2 R_{t-1}, \end{aligned} \tag{3}$$

where Δ denotes a one-period difference, q is the lag length, e_{t-1} is the error correction term and u_t the model residual term. Correspondingly, the ECM on the basis of (2) can be written as:

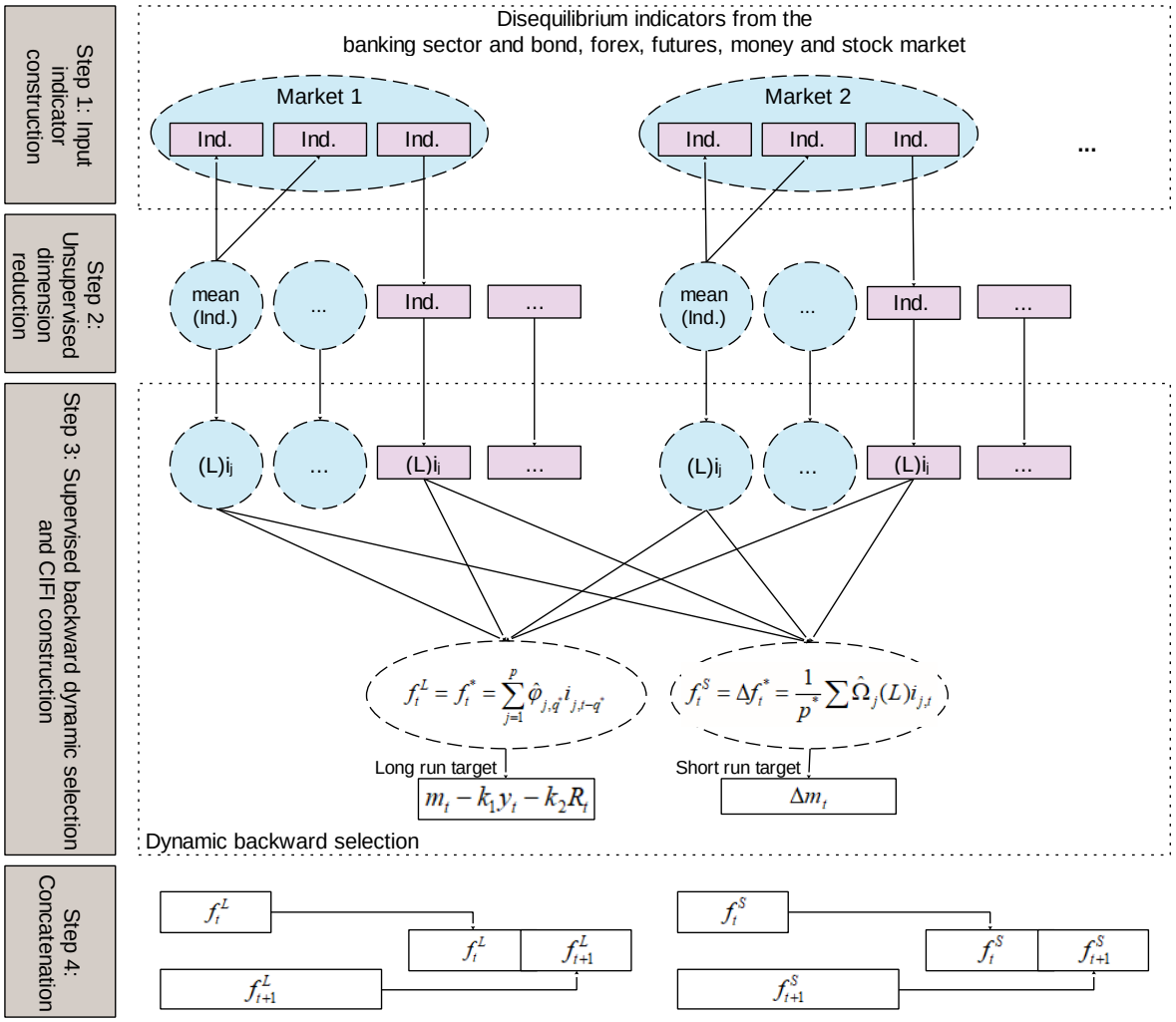
$$\begin{aligned} \Delta m_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \, \Delta m_{t-i} + \sum_{i=0}^{q} \beta_i \, \Delta y_{t-i} + \sum_{i=0}^{q} \theta_i \, \Delta R_{t-i} + \sum_{i=0}^{q} \delta_i \, \Delta R^*_{t-i} - \gamma e^*_{t-1} + \varepsilon_t, \\ e^*_{t-1} = m_{t-1} - k_1 y_{t-1} - k_2 R_{t-1} - k_3 R^*_{t-1}, \end{aligned} \tag{4}$$

Our key postulate is that R^* is latent and can be measured by CIFIs. Denoting these measures by f_t^*, the above model becomes:

$$\Delta m_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \Delta m_{t-i} + \sum_{i=0}^{q} \beta_i \Delta y_{t-i} + \sum_{i=0}^{q} \theta_i \Delta R_{t-i} + \sum_{i=0}^{q} \delta_i \Delta f_{t-i}^* - \gamma e_{t-1}^* + \varepsilon_t,$$
$$e_{t-1}^* = m_{t-1} - k_1 y_{t-1} - k_2 R_{t-1} - k_3 f_{t-1}^*. \quad (5)$$

The CIFI construction algorithm is outlined in Figure 1, whereby the construction of f_t^S as measure of Δf_t^* and f_t^L as measure of f_t^* differs in choice of targets.

Figure 1. CIFI construction algorithm



Notes: Dashed lined circles/eclipse indicate measurements of latent constructs. Solid lined boxes indicate observed variables. Arrows indicate measurement constructs: reflective (upward) and formative/composite (downward).

Over 180 raw financial series are collected in preparation for the CIFI construction. See Appendix B for the full set of financial variables used and their data sources. These series cover the money, foreign exchange, futures, stock and bond markets as well as banking sectors of the 21 economies that constitute the major trading partners of the PRC and TPC. Briefly, the first step involves constructing financial input indicators as disequilibrium indicators (spreads and ratios). Roughly, 115 such

indicators are constructed, and their categorisation is summarised in Table 1. See Appendix B for the full set of input indicators and their construction.

Table 1. Summary of input disequilibrium indicators

Market Category	Indicators	Coverage
Banking sector	Total lending to deposit ratio of the banking sector	2
	Interest rate spread (lending to deposit rate)	7
	Debt to liquidity ratio (M1 to liabilities)	5
Bond market	10 years to 1 (or 2) year(s) government bond spread	11
	30 (or 20) years to 10 years government bond spread	7
	30 (or 20) years to 1 (or 2) year(s) government bond spread	7
Foreign exchange market	PPP as foreign over domestic CPI	20
Futures market	Calendar spread commodity futures	8
	Calendar spread stock futures	7
Money market	3-to-6 months T-bill spread	6
	TED spread	7
	Overnight to 3-months interbank rate spread	8
Stock market	Cross-market ratio foreign over domestic	20

Notes: Input indicators are identical for the PRC and the TPC experiments except for the cross-market ratios (stock market) and PPP (foreign exchange market) where the domestic base variable changes. Further, some indicators in the money market category are excluded if they become domestic indicators.

If appropriate, we aggregate groups of input indicators from each market category listed in Table 1 into composite financial indicators as reflective measures of common shocks for redundancy reduction in the second step. Appropriate groups are identified by means of clustering methods which classify as unsupervised learning. The third step involves supervised dimension reduction. We aggregate the composite and individual financial input indicators into CIFIs by means of partial regression analysis based on the principles of partial least square (PLS) regression (Wold 1966, 1975, 1980) and dynamic backward selection. CIFIs are formative measures in that they represent different facets of financial markets and as such require more than one criterion (Howell, Breivik and Wilcox 2013). PLS adds a predictive target as additional criterion to the common variance criterion underlying standard PCA, making it a supervised learning method. From (4), two targets are identified, a short-run target Δm_t and a long-run target $m_t - k_1 y_t - k_2 R_t$ for the construction of $f_t^S = \Delta f_t^*$ and $f_t^L = f_t^*$ respectively. With the combination of unsupervised and supervised learning methods in steps 2 and 3, the CIFI construction process becomes akin to multi-path PLS. Qin et al. (2018b) confirm the contribution of step 2 by showing that CIFIs constructed with multi-path PLS consistently outperform CIFIs that are constructed with simple PLS. We hence include the unsupervised dimension reduction step throughout. The fourth step comprises regular updating and concatenating of the CIFIs. A detailed description of the CIFI construction algorithm is given in Appendix A.

Our sample data is in monthly frequency from 1993:M9 to 2015:M6. The exception is GDP which is only available in quarterly frequency. Its monthly series is interpolated using monthly industrial production. We select 1994:M6 to 2005:M6 as model training period which ensures a decent level of composite reliability; see Terry and

Kelley (2012). The months before 1994:M6 are used for lag length selection. This leaves us with a 10-year period for model testing with annual model updates. The model testing period is further sub-divided into two periods: the pre-crisis period up to 2007:M6 and the crisis and post-crisis period for the remaining years.

3. Model Results

Our evaluation of the CIFIs is presented in four sub-sections. The first sub-section is dedicated to model training and testing over the pre-crisis period. We evaluate the CIFI-augmented model (5) against the closed economy baseline (3) and a version of (4) in which we adopt the prominent use of US interest rates R_t^{US} as a proxy for foreign opportunity costs in the literature.[1] In the second sub-section, we search for the conditions under which parameter invariance can be maintained during the turbulent period of the GFC. In the third sub-section, we unpack the disaggregate financial shocks to money demand constituting the CIFIs. The exercise enables us to identify transmission channels of disaggregate foreign shocks to domestic money demand and thereby potential sources of foreign risk. The fourth section presents robustness checks of our findings against remaining redundancies in the set of input indicators.

3.1. Model training and pre-crisis testing

Parsimonious model versions of equations (3) to (5) are obtained over the training period by the LSE general-to-specific dynamic model reduction approach akin to dynamic backward selection in the statistical learning literature; see Hendry (1995). The initial maximum lag length is set as $q = 6$. These parsimonious models are referred to as 'MD0' for the baseline model (3), 'MD1' for the CIFI-augmented model (5) and 'MD2' for the US interest rate augmented model version of (4) hereafter. During model reduction search, we settle on the specification of quarterly, instead of monthly, differences for both the M1 and GDP growth variables.

Table 2 summarises the model search results over the training period. We impose a unit long-run income elasticity $k_1 = 1$ for both the PRC and TPC for all three model versions, as it is shown to be data permissive and in line with the existing literature; see Sriram (1999) for a discussion of the role of y_t as scale variable. In the baseline model version, the long-run interest rate coefficient is found to be $k_2 = 0.05$ for the PRC and $k_2 = 0.3$ for TPC respectively; see details on the EC term of MD0 in Table 2.

Potential collinearity problems between k_3 and k_2 arise when accounting for foreign opportunity costs in the open economy models MD1 and MD2. In the case of MD1, we handle this problem by iterative calibration of k_2. The domestic interest rate coefficient shrinks (in absolute measures) for both economies with the inclusion of

[1] On the specific cases of the PRC and TPC see for instance Baharumshah et al. (2009) and Arize (1994).

long-run CIFIs indicating substitution effects. The effect is stronger for TPC suggesting greater openness of the economy and the coefficient on the domestic interest rate becomes similar in size to the PRC. Similarly, we find a strong substitution effect between US and domestic interest rates in the long run of MD2. For TPC the inclusion of US interest rates results in the coefficient sign of the domestic interest rate to switch suggesting wealth effects when controlling for foreign interest rates.

Table 2. Model search results over the training period 1994:M6-2005:M6

		PRC						
		$\Delta_3 m_{t-1}$	$\Delta_3 y_t$	$\Delta_3 y_{t-1}$	$\Delta_2 R_t$	e_{t-3} †		
MD0	Coef.	0.585	0.078	0.113	0.009	-0.060		
	s.e.	0.057	0.021	0.017	0.004	0.018		
	Part. R^2	0.456	0.101	0.276	0.047	0.079		
	Adj. R^2	0.787				† $e_t = m_t - y_t + 0.05\, R_t$		
		$\Delta_3 m_{t-1}$	$\Delta_3 y_t$	$\Delta_3 y_{t-1}$	$\Delta_2 R_t$	e^*_{t-3} †	f_t^S	
MD1	Coef.	0.435	0.094	0.056	0.008	-0.099	2.968	
	s.e.	0.059	0.021	0.018	0.003	0.024	0.474	
	Part. R^2	0.306	0.145	0.073	0.041	0.126	0.242	
	Adj. R^2	0.826				† $e^*_t = m_t - y_t + 0.02\, R_t - f_t^L$		
		$\Delta_3 m_{t-1}$	$\Delta_3 y_t$	$\Delta_3 y_{t-1}$	$\Delta_2 R_t$	e^*_{t-3} †	ΔR^{US}_{t-3}	$\Delta_2 R^{US}_{t-4}$
MD2	Coef.	0.507	0.090	0.110	0.013	-0.097	0.018	-0.012
	s.e.	0.062	0.020	0.016	0.004	0.021	0.008	0.005
	Part. R^2	0.354	0.142	0.285	0.093	0.145	0.039	0.045
	Adj. R^2	0.805				† $e^*_t = m_t - y_t + 0.03\, R_t + 0.02\, R^{US}_t$		
		TPC						
		$\Delta_3 m_{t-1}$	$\Delta_3 y_{t-1}$	ΔR_{t-2}	e_{t-3} †			
MD0	Coef.	0.254	0.268	-0.037	-0.023			
	s.e.	0.079	0.110	0.039	0.009			
	Part. R^2	0.077	0.045	0.007	0.051			
	Adj. R^2	0.417				† $e_t = m_t - y_t + 0.3\, R_t$		
		$\Delta_3 m_{t-1}$	$\Delta_3 y_{t-1}$	ΔR_{t-2}	e^*_{t-3} †	f_t^S	$\Delta_2 f_t^S$	
MD1	Coef.	0.189	0.095	-0.007	-0.164	3.217	2.177	
	s.e.	0.065	0.085	0.030	0.051	0.595	0.554	
	Part. R^2	0.063	0.010	0.000	0.077	0.191	0.111	
	Adj. R^2	0.677				† $e^*_t = m_t - y_t + 0.05\, R_t - f_t^L$		
		$\Delta_3 m_{t-1}$	$\Delta_3 y_{t-1}$	ΔR_{t-2}	e^*_{t-3} †	$\Delta_2 R^{US}_{t-1}$		
MD2	Coef.	0.196	0.190	-0.049	-0.142	0.043		
	s.e.	0.076	0.105	0.044	0.034	0.014		
	Part. R^2	0.051	0.026	0.010	0.122	0.070		
	Adj. R^2	0.478				† $e^*_t = m_t - y_t - 0.05\, R_t + 0.1\, R^{US}_t$		

Notes: Constant and seasonal dummies are not reported here. Seasonal dummies for PRC: January, July, November. Seasonal dummies for TPC: April, May, September. Part. R^2 is partial R-square. Adj. R^2 is adjusted R-square.

The inclusion of CIFIs in MD1 further results in a drop in the own lag coefficient and an increase in the speed of adjustment coefficient (in absolute measures). This demonstrates omitted variable bias in MD0 and strengthens our argument about the importance of incorporating opportunity costs due to openness in money demand equations. Changes in the partial r-squares indicate a substitutive effect on the own lag and a complementary effect on the speed of adjustment coefficient. These effects are similar in direction for the MD2 model, which includes US interest rates, but the effects are more muted than in MD1.

Model comparison results via Cox (1961) encompassing tests over the training and pre-crisis testing period are summarised in Table 3. The null hypothesis of the CIFI model MD1 outperforming the default model MD0 and the US interest rate augmented model MD2 cannot be rejected for both the PRC and TPC. Test results clearly favour MD1 over both MD0 and MD2.

Table 3. Pre-crisis model testing 1994:M6-2007:M6

	Null Hypothesis	Cox Test	[p-value]	Null Hypothesis	Cox Test	[p-value]
			PRC			
1	MD0 > MD1	-12.14	[0.0000]**	MD0 < MD1	-2.508	[0.0121]*
2	MD2 > MD1	-9.740	[0.0000]**	MD2 < MD1	-1.929	[0.0537]
3	MD0 > MD2	-4.852	[0.0000]**	MD0 < MD2	-0.784	[0.4329]
			TPC			
4	MD0 > MD1	-36.05	[0.0000]**	MD0 < MD1	0.672	[0.5015]
5	MD2 > MD1	-27.48	[0.0000]**	MD2 < MD1	0.185	[0.8536]
6	MD0 > MD2	-4.092	[0.0000]**	MD0 < MD2	-5.536	[0.0000]**

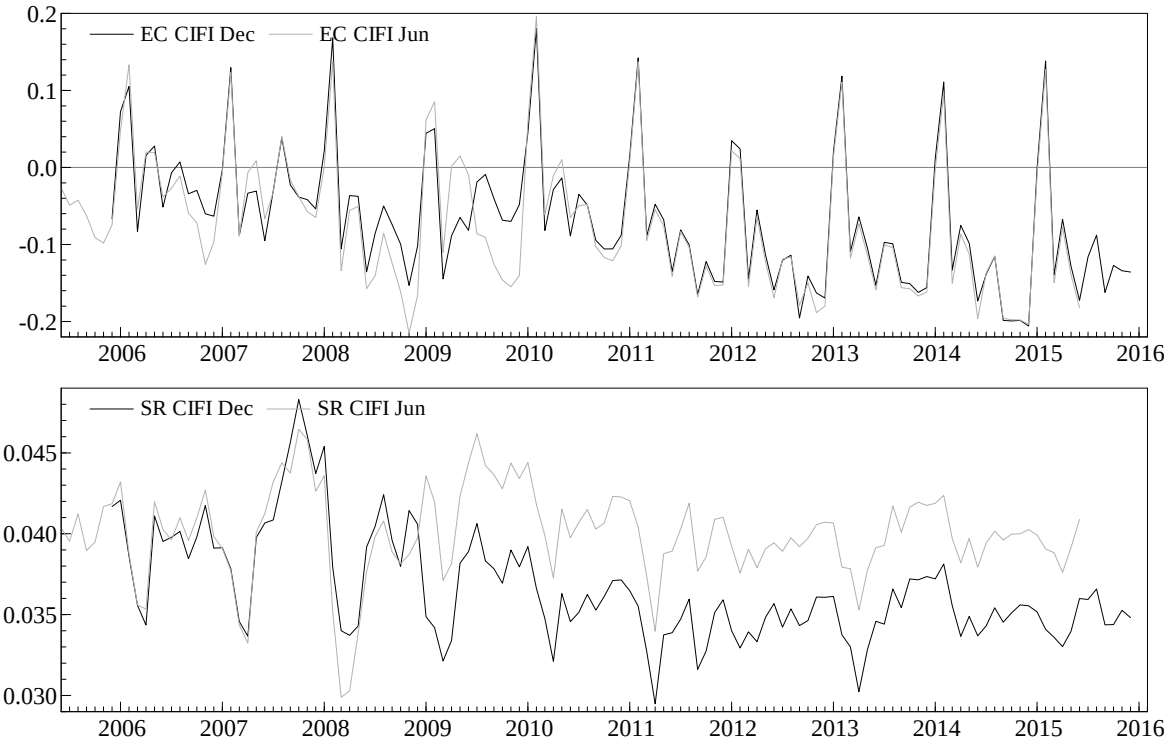
Notes: Cox (1961) encompassing test with test statistic following standard normal under the Null. P-values in brackets. ** indicates significance at the 1% and * significance at the 5% level.

3.2. Crisis and post-crisis testing

The GFC poses a severe challenge to the models shown in Table 2. At the same time, it offers an opportunity to investigate whether parameter constancy of the CIFIs in MD1 can be maintained over this turbulent period. If confirmed, the CIFIs exhibit properties akin to super exogeneity – conditional invariance of an exogenous variable with a time-varying marginal process – underscoring their empirical robustness; see Engle et al. (1983). The investigation is carried out in separate steps for the short-run and long-run CIFIs, with the aim to find which CIFIs, if at all, can help withhold the models' parameter constancy during this turbulent period. Two observations are made. First, we find that synchronisation of CIFI updating with the GFC shock is a key condition for the parameter constancy of the short-run CIFIs. Second, re-calibration of the long-run EC terms is required in the presence of policy induced location shifts to ensure co-breaking in the EC terms; see Hendry and Massmann (2007).

While short-run CIFIs and long-run CIFI augmented EC terms are almost congruent before the 2008 update, the point at which the crisis shock is incorporated into the CIFIs differs with the choice of update point. For the short-run CIFI, the shock results in a permanent location shift. In Figure 3, we demonstrate this by experimenting with two updating points, mid-year (June) as in previous experiments and end-of-year (December) using the PRC data. We find that the end-of-year update results in instability in the short-run CIFI coefficient in MD1 for the PRC at the onset of the GFC, while stability is retained if the updating month is selected mid-year. This shows us that while the GFC shock remains visible in the marginal process of CIFI construction as discussed in the next section, by synchronising the update point with the time point of shock to the target an invariant short-run relationship between CIFI and the money aggregate can be found.

Figure 3. PRC CIFIs with different updating months, 2005:M6 to 2015:M12.



Notes: The top tile depicts e_t^* of (5) with December update (EC CIFI Dec) and June update (EC CIFI Jun). The bottom tile depicts f_t^S with December update (SR CIFI Dec) and June update (SR CIFI Jun). The training period is excluded.

The shock to the long run in MD1 is more permanent, with the speed of adjustment coefficient shrinking steadily from the crisis period onwards regardless the updating month, see Figure 4a. With the PBC's policy intervention during the GFC, the economy became relatively insulated from the instability induced by the external long-run disequilibrium shocks, resulting in a location shift of the EC term. To accommodate the insulation period, we build a hybrid EC term $e_t^{h,*}$ for the PRC which shifts between the CIFI augmented EC term and the default EC term; see (6).

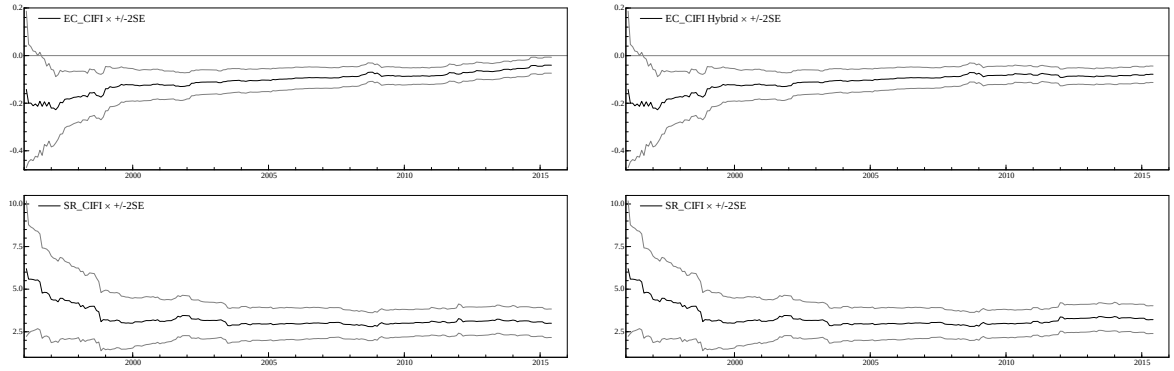
$$e_t^{h,*} = \begin{cases} m_t - y_t + 0.02\, R_t - f_t^L, & t < 2008M6 \\ m_t - y_t + 0.05\, R_t, & 2008M6 \le t < 2014M6 \\ m_t - y_t + 0.02\, R_t - f_t^L, & 2014M6 \le t \end{cases} \tag{6}$$

With the policy intervention of 2008, we shift to the EC term of MD0, excluding opportunity costs due to openness. Foreign influences fully reappear in 2014 and we shift back to the EC term of MD1. By accounting for the PBC's policy response to the GFC through re-calibration of the EC term, parameter stability is retained with long-run variables co-breaking for the PRC model; see Figure 4b.

In contrast to the PRC case, we find that parameter invariance of MD1 remains undisturbed during and after the GFC period for the TPC case. This corresponds to the choice of the TPC central bank, which opted against policy intervention during and after the GFC; see Figure 4c. We conclude that the instability in the PRC model

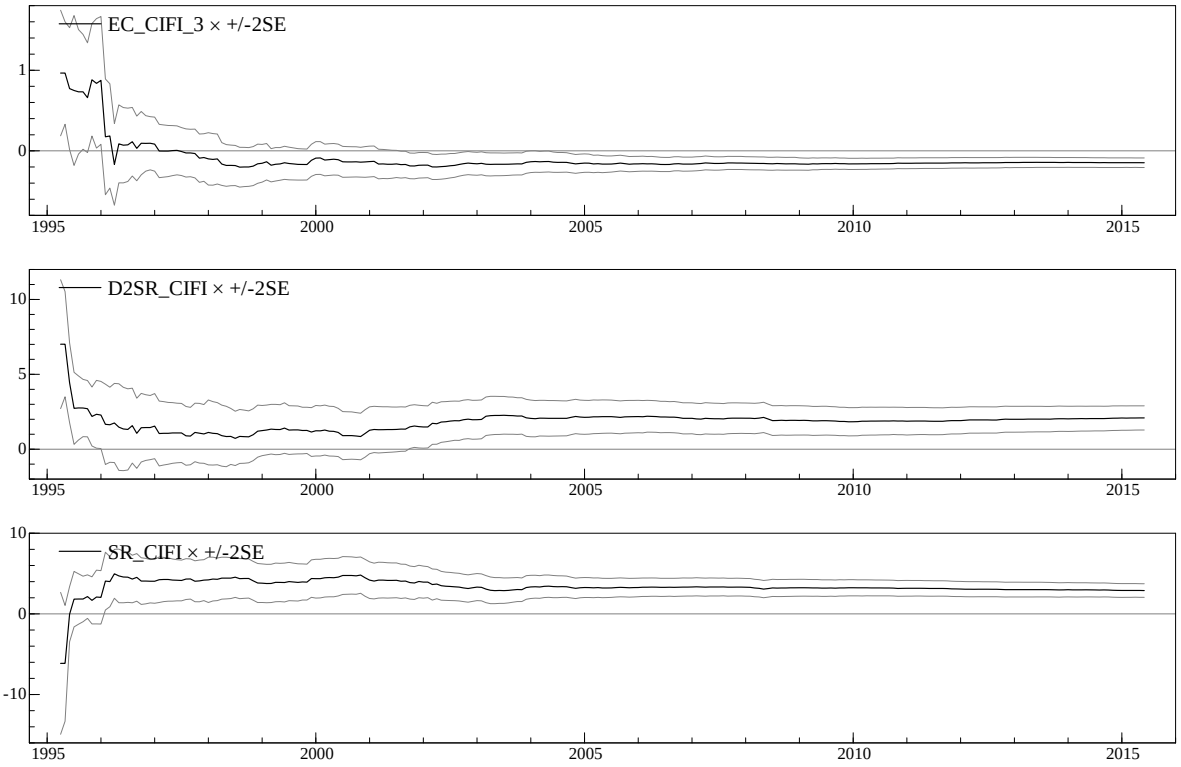
stems from the decisive interventions by the PBC that shielded the domestic economy from long-run disequilibrium foreign shocks. The different performance of short-run and long-run CIFIs in MD1 reveals the value of a targeted approach to CIFI construction. Despite identical sets of input indicators, the two different targets result in two uncorrelated CIFIs reflecting distinct information useful for modelling money demand.

Figure 4. Recursive estimation of MD1 and Hansen parameter instability tests over testing and training period 1994:M6-2015:M6



(a) PRC CIFI model MD1 (b) PRC hybrid CIFI model MD1

Hansen† e_t^* 1.9958** f_t^s 0.8366** Hansen† $e_t^{h,*}$ 0.2668 f_t^s 0.3153



(c) TPC CIFI model MD1

Hansen† e_t^* 0.1724 $\Delta_2 f_t^s$ 0.3744 f_t^s 0.3105

Notes: Figures show recursive coefficient estimates +/- 2 times the standard error in light grey. Estimates are for the June update. † Hansen parameter instability test statistic below figures. ** indicating 1% significance level.

Model comparison results over the GFC and post-GFC period by Cox (1961) and Sargan (1964) model encompassing tests with repeated 12-months updates are summarised in Table 4. Following the insights gained previously, we use the hybrid EC term $e_t^{h,*}$ for the PRC MD1. In the case of TPC, the CIFI model clearly outperforms the baseline model throughout the testing period. In the case of the PRC, we also find that MD1 generally outperforms the baseline model.

Table 4. In-sample encompassing Cox and Sargan test over repeated 12-months updates

	PRC				TPC			
	MD0 > MD1		MD1 > MD0		MD0 > MD1		MD1 > MD0	
	Cox	Sargan	Cox	Sargan	Cox	Sargan	Cox	Sargan
2008:M6	-11.630	31.956	-3.246	4.9873	-35.200	65.521	0.417	0.284
	[0.0000]**	[0.0000]**	[0.0012]**	[0.0255]*	[0.0000]**	[0.0000]**	[0.6769]	[0.8677]
2009:M6	-12.800	33.505	-2.634	3.7038	-37.070	71.028	0.466	0.588
	[0.0000]**	[0.0000]**	[0.0084]**	[0.0543]	[0.0000]**	[0.0000]**	[0.6416]	[0.7452]
2010:M6	-15.170	37.661	-1.683	1.8277	-37.040	76.425	0.571	0.770
	[0.0000]**	[0.0000]**	[0.0924]	[0.1764]	[0.0000]**	[0.0000]**	[0.5682]	[0.6804]
2011:M6	-14.200	39.773	-1.680	1.9278	-37.740	80.193	0.623	1.184
	[0.0000]**	[0.0000]**	[0.0929]	[0.1650]	[0.0000]**	[0.0000]**	[0.5331]	[0.5533]
2012:M6	-13.510	42.333	-1.979	2.6520	-39.040	84.485	0.537	1.107
	[0.0000]**	[0.0000]**	[0.0478]*	[0.1034]	[0.0000]**	[0.0000]**	[0.5912]	[0.5749]
2013:M6	-14.100	45.954	-1.905	2.5390	-40.340	89.036	0.580	1.138
	[0.0000]**	[0.0000]**	[0.0568]	[0.1111]	[0.0000]**	[0.0000]**	[0.5619]	[0.5661]
2014:M6	-13.100	44.768	-2.362	3.660	-42.470	94.309	0.517	0.986
	[0.0000]**	[0.0000]**	[0.0182]*	[0.0557]	[0.0000]**	[0.0000]**	[0.6052]	[0.6109]
2015:M6	-12.02	41.957	-2.541	4.1313	-44.130	99.001	0.360	0.662
	[0.0000]**	[0.0000]**	[0.0111]*	[0.0421]*	[0.0000]**	[0.0000]**	[0.7186]	[0.7182]

Notes: MD0 is default and MD1 is the CIFI model. P-values in brackets. ** 1% significance level and * 5% significance level.

3.3. Tracing Sources of Disaggregate Financial Risks via Weight Analysis

The previous two sub-sections clearly establish MD1 as the favoured model design over MD0 and MD2, confirming the conjecture of omitted variable bias in MD0 and supporting CIFIs as measures for latent opportunity costs due to openness. The supervised learning component in the CIFI construction algorithm enables us to evaluate the weights and dynamic forms with which different input indicators enter the CIFIs. The weights of individual input indicators provide valuable insights into the sensitivity of aggregate money demand to opportunity costs and risks arising from disaggregate foreign financial conditions. The weight structure of short-run CIFIs and long-run CIFIs is different by construction, as explained in section 2 and Appendix A. Specifically, short-run CIFIs capture positive (pro-cyclical) or negative (counter-cyclical) shocks while long-run CIFIs capture long-run equilibrium conditions. We will analyse the disaggregate evidence for the short-run and long-run CIFIs in turn.

Short-run CIFI weights and lag structures are summarised as heat maps in Figures A5-A8 in Appendix C. Shocks from banking sector liquidity and foreign exchange markets enter with the largest weights. Results for the foreign exchange markets are unsurprising, but the large weight on excess liquidity from the banking sector is not yet a prominent feature in the literature in the context of narrow money and suggests

some spill-over effects from expansionary monetary policy in the US and Euro area. Further, shocks from stock markets and money markets are of counter-cyclical nature, while liquidity shocks from the banking sectors are pro-cyclical indicating potential risks from the latter. Input indicators from the bond markets appear to have slower dynamics than the target which causes them to drop out of the short-run CIFIs. Further, disequilibrium shocks from the US enter with the largest weights compared to the remaining trading partners, making it the most important economy to watch for both the PRC and TPC case. Commodity futures and money market indicators, in particular interbank rate spreads, contain the most leading information with respect to the short-run targets, with input indicators entering with longer lags than for the remaining financial markets.

Comparing results between the PRC and TPC, weights are overall more stable for TPC than for the PRC. Especially money market input indicator weights for the PRC are interrupted following the policy intervention in late 2008 implying that interventions have shielded against shocks originating from money markets but not the remaining markets. No such break is detectable in the TPC case.

Turning to long-run CIFIs, weights and lag structures are summarised in Tables A9-A12 in Appendix C. We find remarkable heterogeneity in signs of weights, with input indicators from the same markets but different geographic locations frequently entering with both negative and positive signs. Considering the different market segments separately, disaggregate effects from different economies seem to offset each other, making the aggregate market impact within different financial markets relatively neutral. The finding demonstrates the composite nature of disaggregate financial market pricing impacts.

For the PRC, only weights from the foreign exchange and the stock futures market are consistent in their direction across geographic locations; positive for foreign exchange indicators and negative for stock futures indicators. The negative sign for stock futures is in line with the opportunity cost theory. Investment in futures becomes more attractive with an increase in calendar spreads which suggests an expected increase in the value of the stock. The opportunity cost channel seems to outweigh the inflation channel as commodity futures enter with only a small positive coefficient. Regarding the foreign exchange input indicators, an increase in purchasing power parity implies appreciation pressure which results in pressure to expand the money base, hence the positive sign is expected. For TPC, weights from the money markets are consistent in their direction, however, signs differ across categories. Interbank rate spreads enter with a negative sign, while T-bill spreads enter with a positive sign, suggesting substitution effect for interbank rates and wealth effects for T-bill rates, with different investor types being active in these markets.

Weights of the PRC long-run CIFI are overall more constant than those of the TPC case and weight shifts occur later in the PRC case as compared to the TPC case. For instance, sign switches of indicator weights in the TPC long-run CIFI are

observed across foreign exchange, bond and money market input indicators from the US, Canada and Japan. The switch in sign for indicators associated with markets in the US and Canada is opposite to those in Japan reflecting the reversal of flows during and after the GFC (Wu et al. 2014).

Interestingly, despite the shifting weights, coefficient estimates in the CIFI augmented model MD1 for TPC are stable. However, the domestic policy shift in form of the PBC's intervention during and after the GFC period cannot be mitigated by weight shifts in the CIFI construction. Instead, model stability requires re-calibration for the model to reflect the domestic policy shift.

3.4. Sensitivity analysis

With a view on the structure of weights observed, we conduct two rounds of sensitivity analysis with respect to the dimension reduction steps outlined in Figure 1. First, the original short-run CIFI for the PRC is dominated by weights of the input indicator from the first foreign exchange market group in 2005 and 2006. Weights are large and highly significant for the training period and the first update and turn insignificant for all consecutive updates. The turn to insignificance coincides with a shift in the exchange rate regime from fixed to a managed float, suggesting that the shift has turned the indicators to irrelevance. We hence conduct additional experiments by constructing the short-run CIFI without the first forex market group included. Results show that the two CIFI versions are almost identical and PRC MD1 model results are robust to the exclusion of this one composite input indicator. Further, observations of the weights from the bond market for both the PRC and TPC show us that individual input indicators from the same geographic locations, Canada, Spain and Japan, enter with the same weight. In order to examine if these indicators are repetitively over-representative, we exclude, in a second sensitivity analysis, one of the two input indicators from Canada, Spain and Japan and re-construct the long-run and short-run CIFI. Results show that CIFIs are insensitive to dropping these input indicators.

Two insights for future research are gained by these sensitivity analyses. First, prolonged significance of weights over several updates could be a valuable additional criterion for input indicator selection for the construction of the short-run CIFIs. Second, the unsupervised dimension reduction step prior to aggregation might require additional criteria as some redundancies remain undetected. With these points in mind, some iterative procedure for input indicator selection and redundancy reduction is needed to further refine our CIFI construction in the future.

4. Conclusion

We explore a novel model-based approach to constructing measures of opportunity cost due to openness, referred to as CIFIs, in money demand equations for two foreign-trade oriented economies, the PRC and TPC. The approach is motivated by

the observation that economic openness poses challenges to the stability of conventional money demand models which omit or inadequately represent opportunity cost effects from abroad. Existing evidence suggest that the main cause of instability is indeed the lack of an appropriate measure for such effects in an open economy context. The PRC and TPC differ substantially in terms of size, financial integration and response to the GFC. Appropriate measures for opportunity costs are hence expected to differ between these two economies.

Our algorithm for CIFI construction combines reflective and formative modelling methods for measurement. CIFIs are constructed as an aggregate of a broad set of dis-synchronised financial disequilibrium input indicators, each of which represents a distinct facet of financial market frictions. Dimension reduction is achieved in two stages via redundancy reduction using unsupervised learning methods (reflective) and via backward dynamic selection using supervised learning methods (formative). Based on an error-correction specification of the money demand model, we exploit two possible targets for the CIFIs, the change in narrow money as a short-run target and the closed economy EC term as the long-run target. The weights found for each input indicator differ between the two economies thereby revealing the specific sensitivities of money demand in the PRC and TPC to disequilibria in the international financial markets and different dynamic forms of the long-run and short-run targets. Concatenation operation is imposed through regular updates, allowing for the composition of the CIFIs to update without altering past values and thereby making them comparable to non-model-based composites.

Two periods are considered for testing the CIFIs, the relatively tranquil pre-crisis period and the period including the GFC and its aftermath. In the case of TPC, where the central bank did not intervene during the crisis period, a stable money demand relationship is found across testing periods by augmenting a standard closed economy money demand equation by the constructed CIFIs. Looking more closely into the disaggregate composition of the CIFIs reveals that the volatility of the GFC period is reflected in instability of weights with which input indicators enter the CIFIs. In the case of the PRC, a stable money demand equation is found when constructing a hybrid EC term for the CIFI-augmented model. Specifically, the EC term switches to a closed economy version during the PRC's policy intervention period which included temporarily pegging the exchange rate to the US dollar and reinstating capital controls. These findings firstly underscore the importance of regular data updating and concatenation of the CIFIs to allow for the incorporation of foreign structural shifts and second reveal the need for model calibration if the structural shift is domestic in form of policy interventions.

Evaluating disaggregate financial shocks through input indicator weights reveals the relative importance of disequilibria in the money markets as transmission channels of foreign shocks to the domestic money demand and the risk of pro-cyclical shocks from foreign banking sectors. Our findings demonstrate the potential of the CIFIs to identify sources of foreign risk to domestic money demand providing valuable insights to policy makers.

Sensitivity analysis through alteration of the sets of financial input indicators used for CIFI construction shows us that additional criteria for the selection of input indicator and redundancy reduction are desirable for further improvement of the CIFI construction algorithm. Moreover, the current CIFI construction disregards the possibility of dynamic interactions among formative input indicators. Allowing for interaction effects should be considered for future research.

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Appendix A – Algorithm for CIFI Construction

The CIFI construction algorithm is designed (a) to produce a composite aggregate from a set of input indicators that has adequate financial market coverage with each indicator representing a different facet of financial markets, (b) to allow for dis-synchronisation among financial markets, (c) to fulfil the fundamental measurement attribute of time-wise concatenation, and (d) to produce targeted CIFIs; see Qin et al (2018a). The algorithm achieves these objectives with a combination of unsupervised and supervised learning strategies. Recalling Figure 1, the algorithm for CIFI construction can be presented in four steps: 1) input indicators construction, 2) unsupervised dimension reduction, 3) supervised dynamic backward selection, 4) updating and concatenation.

Step 1: Input indicator construction

We select and construct financial input indicators as input features from different financial market categories including the banking sector, bond market, foreign exchange market, money market, futures market and stock market as disequilibrium indicators. Disequilibrium indicators are ratios or spreads representing financial market frictions. By use of ratios or spreads we follow insights from Qin and He (2012), Wang (2017) and Qin et al (2018a), who show that indicators constructed by differencing financial variables largely capture noise or everyday volatility with little relevance for macro variables which exhibit substantially slower dynamics and inertia, while disequilibrium indicators which capture features of imbalances or disequilibria across different financial markets are a better match. By using disequilibrium indicators, we also follow recent calls for greater emphasis on financial frictions in empirical macroeconomics, e.g. see Drehmann et al (2012), Borio (2013, 2014) and Vines and Wills (2018).

Step 2: Unsupervised Dimension Reduction

A plethora of highly colinear input indicators requires unsupervised dimension reduction before (target specific) supervised dynamic selection since multiple indicators with similar or identical (redundant) information could result in unduly weight being given to a single information shock. Hence, indicators are grouped with the aim to reduce redundancy among input indicators by capturing common shocks (or information) in single composite input indicators. The grouping algorithm is based on correlation distance measure. Take Pearson correlation coefficient:

$$COR(i_{jt}, i_{kt}) = \frac{\sum_{t=1}^{T}(i_{jt}-\overline{i_{jt}})(i_{kt}-\overline{i_{kt}})}{\sqrt{\sum_{t=1}^{T}(i_{jt}-\overline{i_{kt}})^2}\sqrt{\sum_{t=1}^{T}(i_{kt}-\overline{i_{kt}})^2}} \quad \text{(A1)}$$

The distance is calculated:

$$d_{cor}(i_{jt}, i_{kt}) = \sqrt{2\left(1 - COR(i_{jt}, i_{kt})\right)} \quad \text{(A2)}$$

We first pre-group the indicators according to the six financial market categories as shown in Table 1. We then run the grouping algorithm on each category separately for four different sub-samples for robustness: 1992-2007 and over the same period with the Asian financial crisis 1997-1999 excluded, 2003-2017 and over the same period with the GFC 2007-2010 excluded. We apply hierarchical clustering based on the distance matrix obtained from the indicators (Sokal and Michener 1958). Multiple criteria are used to determine the optimal number of groups.[5] If identified groups are consistent across all four sub-samples or for three out of four sub-samples and the grouping makes economic sense, indicators are combined into a single group. Input indicators in each group are averaged as a reflective measure of one common financial shock (blue circles in Figure 1). The average is then used as an input indicator in the CIFI construction instead of the individual input indicators. Indicators that are not consistently grouped or are not allocated to a group by the algorithm enter as individual input indicators (pink boxes in Figure 1).

The contribution of redundancy reduction via the grouping stage to model performance has been evaluated in Qin et al (2018b). The authors run extensive experiments to evaluate the unsupervised dimension reduction step and find that CIFIs that include grouped input indicators strongly and consistently outperform CIFIs that only contain individual input indicators. Considering these findings, we impose the unsupervised dimension reduction step for CIFI construction. Grouping results are summarised in Table 4A in Appendix C.

Step 3: Supervised Backward Dynamic Selection

Recalling (3), two possible targets come to mind for the CIFI construction, the differenced money demand Δm_t which we refer to as the short-run target and the disequilibrium error term e_t which we refer to as the long-run target. The composite constructs of the short-run and long-run type appear in (5) as measures of Δf_t^* and f_t^* respectively. Let us consider the construction of the long-run CIFI first.

Long-run target

For the long-run target, we exploit the Engle-Granger two-step procedure in the estimation of ECMs and the common finding that narrow money, total expenditure and domestic interest rate are co-trending such that $(m_t - k_1 y_t - k_2 R_t)$ in (3) is detrended. The long-run disequilibrium is utilized as target in the partial regression of (A3) which takes the form of a finite distributed lag model to allow for dis-synchronization among input indicators, whereby $i_{j,t}$ are composite and individual financial disequilibrium input indicators, p is the total number of indicators and q is the maximum lag length considered:

$$(m_t - k_1 y_t - k_2 R_t) = \sum_{i=0}^{q} \varphi_{j,i}\, i_{j,t-i} + \epsilon, \qquad j = 1, \ldots, p \tag{A3}$$

[5] The evaluation indicators are kl, ch, hartigan, cindex, db, silhouette, duda, pseudot2, ratkowsky, ball, tbiserial, gap, mcclain, gamma, gplus, tau, dunn, sdindex, and sdbw; see Charrad et al (2012) for details.

Only one lag q^* among q is chosen per input indicator for the construction of the long-run CIFI f_t^L as a measure of f_t^* in (A4) to enforce a match with the slow dynamics of the target. The choice falls on the largest estimated weight $\hat{\varphi}_{j,q^*}$ in absolute value that emerges from the estimation of (A3) by the PLS algorithm with component equal to 1.

$$f_t^L = f_t^* = \sum_{j=1}^{p} \hat{\varphi}_{j,q^*} \, i_{j,t-q^*} \tag{A4}$$

The long-run CIFI is then used to construct e_t^* in (5) whereby $k_3 = 1$ as implicit in the CIFI construction.

Short-run target

An obvious target from (3) for the short-run CIFI construction is Δm_t. Similar to (A3), estimation of weights for CIFI construction is based on a partial regression formulated in (A5) which also takes on the form of a finite distribute lag model with maximum lag length q. However, contemporaneous terms are excluded from (A5) while considered in (A3), and (A5) is estimated via OSL and dynamic backward selection.

$$\Delta m_t = \sum_{i=1}^{q} \Omega_{i,j} \, i_{j,t-i} + \vartheta, \qquad j = 1, \ldots, p \tag{A5}$$

In contrast to (A4), all significant lags q^* from (A5) are used for the construction of the short-run CIFI in (A6), whereby L denotes the lag operator. Indicators with no significant lag drop out so that $p^* < p$, with p^* being the number of indicators with at least one significant lag.

$$f_t^S = \Delta f_t^* = \frac{1}{p^*} \sum \hat{\Omega}_j \, (L) i_{j,t} \tag{A6}$$

The lag structure in f_t^S is hence more complex than in f_t^L which opens the possibility for non-linear input in form of differences in the short-run CIFI. Despite the use of contemporaneous terms in the construction of the long-run CIFI, both f_t^L and f_t^S when included in (5) contain only leading information since e_t^* which incorporates f_t^L enters as a leading indicator by construction.

Step 4: Updating and Concatenation

Using monthly data, we set data updating at a 12-month interval for the model testing period. After each data update the CIFIs are concatenated; see Table A1. The CIFI is first constructed over the training period. The training period is then extended by 12 months and the CIFI re-estimated. The training period CIFI and the updated index are then combined as shown below. This way, historical invariance of indices is ensured during updating.

Table A1. Time-wise concatenation operation

	1994:M6	2005:M6	2006:M6	2007:M6
Training Period	CIFI 2005			
First Update	CIFI 2006			
	CIFI 2005	CIFI 2006		
Second Update	CIFI 2007			
	CIFI 2005	CIFI 2006	CIFI 2007	

Source: Authors.

Appendix B – Data

Table A2. Variables and data sources

	Description	Source	Series title
O1	Overnight market interest rate of Australia	OECD, Main economic indicators	Overnight market interest rate of Australia
O2	Overnight market interest rate of Belgium	Thomson Reuters	BG EU- FRANC T/N DEPOSIT (FT/TR)
O3	Overnight market interest rate of Canada	CANSIM - Statistics Canada	CANADA OVERNIGHT MNY MARKET FINANCING
O4	Overnight market interest rate of Italy	A.D.B. Analisi Dati Borsa S.p.A.	ITALY INTERBANK O/N ATIC
O5	Overnight market interest rate of Japan	Bank of Japan	JAPAN UNCOLLATER. OVERNIGHT
O6	Overnight market interest rate of Spain	Banco de Espana	SPAIN INTERBANK O/N
O7	Overnight market interest rate of TPC	TEJ - The TPC Economic Journal	TPC INTERBANK SWAP OVERNIGHT
O8	Overnight market interest rate of US	OECD, Main economic indicators	US: Overnight Interbank Rate
O9	3-month market interest rate of Australia	Barclays Bank PLC	AUSTRALIAN $ TO US $ 3M FWD (BBI) - EXCHANGE RATE
O10	3-month market interest rate of Belgium	National Bank of Belgium	BELGIUM TREASURY BILL 3 MONTH
O11	3-month market interest rate of Canada	CANSIM - Statistics Canada	CANADA TREASURY BILL 3 MONTH
O12	3-month market interest rate of France	Thomson Reuters Datastream	FR 3M INTBK DELAYED SEE EIBOR3M
O13	3-month market interest rate of Italy	Ministry of Economy and Finance, Italy	ITALY T-BILL AUCT. GROSS 3 MONTH
O14	3-month market interest rate of Japan	ICE Benchmark Administration Ltd.	IBA JPY IBK. LIBOR 3M DELAYED
O15	3-month market interest rate of Spain	ICE Benchmark Administration Ltd.	ES IBK.3M IBA DUP USE BBEUR3M
O16	3-month market interest rate of TPC	TEJ - The TPC Economic Journal	TPC MONEY MARKET 90 DAYS
O17	3-month market interest rate of UK	Bank of England	UK BOE LIBID/LIBOR 3 MONTH
O18	3-month market interest rate of US	Thomson Reuters Datastream	US INTERBANK RATE - 3 MONTH
O19	Exchange rate of Australia	MSCI	MSCI AUD TO 1 USD - EXCHANGE RATE
O20	Exchange rate of Belgium	GTIS - FTID/TR	BELGIAN FRANC CM. TO US $ (GTIS DISC - EXCHANGE RATE
O21	Exchange rate of Brazil	GTIS - FTID/TR	BRAZILIAN REAL TO US $ (GTIS/TR) - EXCHANGE RATE
O22	Exchange rate of Canada	GTIS - FTID/TR	CANADIAN $ TO US $ (GTIS/TR) - EXCHANGE RATE
O23	Exchange rate of PRC	GTIS - FTID/TR	CHINESE RENMINBI TO US $(GTIS/TR) - EXCHANGE RATE
O24	Exchange rate of France	GTIS - FTID/TR	FRENCH FRANC TO US $ (GTIS DISC - EXCHANGE RATE
O25	Exchange rate of Germany	Barclays Bank PLC	GERMAN MARK TO US $ (BBI) - EXCHANGE RATE
O26	Exchange rate of India	GTIS - FTID/TR	INDIAN RUPEE TO US $ (GTIS/TR) - EXCHANGE RATE
O27	Exchange rate of Indonesia	GTIS - FTID/TR	INDONESIAN RUPIAH TO US $(GTIS/TR) - EXCHANGE RATE
O28	Exchange rate of Italy	GTIS - FTID/TR	ITALIAN LIRA TO US $ (GTIS DISC - EXCHANGE RATE
O29	Exchange rate of Japan	Barclays Bank PLC	JAPANESE YEN TO US $ (BBI) - EXCHANGE RATE
O30	Exchange rate of Malaysia	GTIS - FTID/TR	MALAYSIAN RINGGIT TO US $ (GTIS/TR) - EXCHANGE RATE
O31	Exchange rate of Netherlands	GTIS - FTID/TR	NETH. GUILDER TO US $ (GTIS) DISC - EXCHANGE RATE
O32	Exchange rate of Philippines	GTIS - FTID/TR	PHILIPPINE PESO TO US $ (GTIS/TR) - EXCHANGE RATE
O33	Exchange rate of South Korea	GTIS - FTID/TR	SOUTH KOREAN WON TO US $ (GTIS/TR) - EXCHANGE RATE
O34	Exchange rate of Singapore	GTIS - FTID/TR	SINGAPORE $ TO US $ (GTIS/TR) - EXCHANGE RATE
O35	Exchange rate of Spain	GTIS - FTID/TR	SPANISH PESETA TO US $ (GTIS DISC - EXCHANGE RATE
O36	Exchange rate of TPC	GTIS - FTID/TR	TPC NEW $ TO US $ (GTIS/TR) - EXCHANGE RATE
O37	Exchange rate of Thailand	GTIS - FTID/TR	THAI BAHT TO US $ (GTIS/TR) - EXCHANGE RATE

O38	Exchange rate of UK	GTIS - FTID/TR	UK POUND TO US $ (GTIS/TR) - EXCHANGE RATE
O39	Stock market index of Australia	MSCI	MSCI AUSTRALIA - PRICE INDEX
O40	Stock market index of Belgium	MSCI	MSCI BELGIUM - PRICE INDEX
O41	Stock market index of Brazil	MSCI	MSCI BRAZIL - PRICE INDEX
O42	Stock market index of Canada	MSCI	MSCI CANADA - PRICE INDEX
O43	Stock market index of PRC	MSCI	MSCI PRC - PRICE INDEX
O44	Stock market index of France	MSCI	MSCI FRANCE - PRICE INDEX
O45	Stock market index of Germany	MSCI	MSCI GERMANY - PRICE INDEX
O46	Stock market index of India	MSCI	MSCI INDIA - PRICE INDEX
O47	Stock market index of Indonesia	MSCI	MSCI INDONESIA - PRICE INDEX
O48	Stock market index of Italy	MSCI	MSCI ITALY - PRICE INDEX
O49	Stock market index of Japan	MSCI	MSCI JAPAN - PRICE INDEX
O50	Stock market index of Malaysia	MSCI	MSCI MALAYSIA - PRICE INDEX
O51	Stock market index of Netherlands	MSCI	MSCI NETHERLANDS - PRICE INDEX
O52	Stock market index of Philippines	MSCI	MSCI PHILIPPINES - PRICE INDEX
O53	Stock market index of Singapore	MSCI	MSCI SINGAPORE - PRICE INDEX
O54	Stock market index of Spain	MSCI	MSCI SPAIN - PRICE INDEX
O55	Stock market index of South Korea	MSCI	MSCI KOREA - PRICE INDEX
O56	Stock market index of TPC	MSCI	MSCI TPC - PRICE INDEX
O57	Stock market index of Thailand	MSCI	MSCI THAILAND - PRICE INDEX
O58	Stock market index of UK	MSCI	MSCI UK - PRICE INDEX
O59	Stock market index of US	MSCI	MSCI USA - PRICE INDEX
O60	1-year government bond of Belgium	National Bank of Belgium	BELGIUM TREASURY BILL 1 YEAR
O61	1-year government bond of Canada	CANSIM - Statistics Canada	CANADA TREASURY BILL 1 YEAR
O62	1-year government bond of France	Banque de France	FRANCE TREASURY BILL 12 MONTHS
O63	1-year government bond of Germany	Thomson Reuters Datastream	TR GERMANY GVT BMK BID YLD 2Y (E)
O64	1-year government bond of Italy	Thomson Reuters Datastream	TR ITALY GVT BMK BID YLD 2Y (E)
O65	1-year government bond of Malaysia	Bank Negara Malaysia	Government Securities Yield: 1 Year
O66	1-year government bond of Spain	Banco de Espana	SPAIN TREASURY BILL 1 YEAR
O67	1-year government bond of US	Thomson Reuters Datastream	United States GVT BMK Bid Yield 1 Year
O68	2-year government bond of Australia	Thomson Reuters Datastream	TR AUSTRALIA GVT BMK BID YLD 2Y (A$)
O69	2-year government bond of Japan	Thomson Reuters Datastream	TR JAPAN GVT BMK BID YLD 2Y (Y) - RED. YIELD
O70	2-year government bond of UK	Thomson Reuters Datastream	TR UK GVT BMK BID YLD 2Y (£)
O71	10-year government bond of Australia	Reserve Bank of Australia	AUSTRALIA BOND YIELD 10 Y
O72	10-year government bond of Belgium	Thomson Reuters Datastream	BELGIUM BENCHMARK BOND 10 YR (DS)
O73	10-year government bond of Canada	CANSIM - Statistics Canada	CANADA GOVT. BNCHMK. BOND 10 YEAR
O74	10-year government bond of France	Banque de France	FRANCE TREASURY BILL 10 YEARS
O75	10-year government bond of Germany	Thomson Reuters Datastream	GERMANY BENCHMARK BOND 10 YR (DS)
O76	10-year government bond of Italy	Thomson Reuters Datastream	ITALY BENCHMARK BOND 10 YR (DS) - RED. YIELD
O77	10-year government bond of Japan	Thomson Reuters Datastream	TR JAPAN GVT BMK BID YLD 10Y (Y)
O78	10-year government bond of Malaysia	Bank Negara Malaysia	Government Securities Yield: 10 Years

O79	10-year government bond of Spain	Banco de Espana	SPAIN GOVERNMENT BOND 10 YEAR
O80	10-year government bond of UK	Thomson Reuters Datastream	UK BENCHMARK BOND 10 YR (DS)
O81	10-year government bond of US	OECD, Main economic indicators	US Yield 10-Year FED GVT SECS NADJ
O82	20-year government bond of Canada	CIBC World Markets	CANADA BENCHMARK BOND 20 YEAR
O83	20-year government bond of Japan	Thomson Reuters Datastream	TR JAPAN GVT BMK BID YLD 20Y (Y)
O84	20-year government bond of UK	Thomson Reuters Datastream	TR UK GVT BMK BID YLD 20Y (£)
O85	20-year government bond of US	Thomson Reuters Datastream	TR US GVT BMK BID YLD 30Y (U$)
O86	30-year government bond of Germany	Deutsche Bundesbank	BUBA YIELD - LISTD FEDRL SEC 15-30Y
O87	30-year government bond of Spain	Thomson Reuters Datastream	TR SPAIN GVT BMK BID YLD 30Y (E)
O88	30-year government bond of France	Banque de France	FRANCE TREASURY BILL 30 YEARS
O89	30-year government bond of US	Thomson Reuters Datastream	TR US GVT BMK BID YLD 30Y (U$) - RED. YIELD
O90	3-month T bill of Belgium	National Bank of Belgium	BELGIUM TREASURY BILL 3 MONTH
O91	3-month T bill of Canada	Thomson Reuters Datastream	CANADA TREASURY BILL 3 MONTH
O92	3-month T bill of France	Banque de France	FRANCE TREASURY BILL 3 MONTHS
O93	3-month T bill of Italy	Ministry of Economy and Finance, Italy	ITALY T-BILL AUCT. GROSS 3 MONTH
O94	1-3-month T bill of Spain	Banco de Espana	SPAIN TREASURY BILL 1-3 MONTH
O95	3-month T bill of UK	United Kingdom Debt Management Office	UK TREASURY BILL TENDER 3M.
O96	3-month T bill of US	Federal Reserve	US T-BILL 3 Month (W)
O97	6-month T bill of Belgium	National Bank of Belgium	BELGIUM TREASURY BILL 6 MONTH
O98	6-month T bill of Canada	CANSIM - Statistics Canada	CANADA TREASURY BILL 6 MONTH
O99	6-month T bill of France	Banque de France	FRANCE TREASURY BILL 6 MONTHS
O100	6-month T bill of Italy	Ministry of Economy and Finance, Italy	ITALY T-BILL AUCT. GROSS 6 MONTH
O101	6-month T bill of Spain	Banco de Espana	SPAIN TREASURY BILL 6 MONTH
O102	6-month T bill of US	Federal Reserve	US T-BILL 3 Month (W)
O103	Deposit rate of Australia	International Monetary Fund	AU: Deposit Rate
O104	Deposit rate of Canada	International Monetary Fund	CA: Deposit Rate
O105	Deposit rate of Indonesia	International Monetary Fund	ID: Deposit Rate
O106	Deposit rate of Japan	International Monetary Fund	JP: Deposit Rate
O107	Deposit rate of Malaysia	International Monetary Fund	MY: Deposit Rate
O108	Deposit rate of South Korea	International Monetary Fund	KR: Deposit Rate
O109	Deposit rate of Thailand	International Monetary Fund	TH: Deposit Rate
O110	Lending rate of Australia	International Monetary Fund	AU: Lending Rate
O111	Lending rate of Canada	International Monetary Fund	CA: Lending Rate
O112	Lending rate of Indonesia	International Monetary Fund	ID: Lending Rate
O113	Lending rate of Japan	International Monetary Fund	JP: Lending Rate
O114	Lending rate of Malaysia	International Monetary Fund	MY: Lending Rate
O115	Lending rate of South Korea	International Monetary Fund	KR: Lending Rate
O116	Lending rate of Thailand	International Monetary Fund	TH: Lending Rate
O117	Stock market derivatives market FTSE100 rate nearest to maturity	NYSE Euronext Liffe via Thomson Reuters Datastream	LIFFE-FTSE 100 Index TRC1
O118	Stock market derivatives market HANG_SENG rate nearest to maturity	Hong Kong Futures Exchange via Thomson Reuters Datastream	HKFE-Hang Seng Index TRC1
O119	Stock market derivatives market TOPIX rate nearest to maturity	Osaka via Thomson Reuters Datastream	TSE-TOPIX Index TRC1

O120	Stock market derivatives market S&P 500 rate nearest to maturity	Chicago Mercantile Exchange via Thomson Reuters Datastream	CME-S&P 500 Index TRC1
O121	Stock market derivatives market EUREX-DAX rate nearest to maturity	EUREX Deutschland via Thomson Reuters Datastream	EUREX-DAX Index TRC1
O122	Stock market derivatives market AEX rate nearest to maturity	Euronext.liffe Amsterdam via Thomson Reuters Datastream	AEX-AEX Index TRC1
O123	Stock market derivatives market EUREX-SMI rate nearest to maturity	EUREX Deutschland via Thomson Reuters Datastream	EUREX-SMI TRC1
O124	Stock market derivatives market FTSE100 rate next nearest to maturity	NYSE Euronext Liffe via Thomson Reuters Datastream	LIFFE-FTSE 100 Index TRC4
O125	Stock market derivatives market HANG_SENG rate next nearest to maturity	Hong Kong Futures Exchange via Thomson Reuters Datastream	HKFE-Hang Seng Index TRC4
O126	Stock market derivatives market TOPIX rate next nearest to maturity	Osaka via Thomson Reuters Datastream	TSE-TOPIX Index TRC4
O127	Stock market derivatives market S&P 500 rate next nearest to maturity	Chicago Mercantile Exchange via Thomson Reuters Datastream	CME-S&P 500 Index TRC4
O128	Stock market derivatives market EUREX-DAX rate next nearest to maturity	EUREX Deutschland via Thomson Reuters Datastream	EUREX-DAX Index TRC4
O129	Stock market derivatives market AEX rate next nearest to maturity	Euronext.liffe Amsterdam via Thomson Reuters Datastream	AEX-AEX Index TRC4
O130	Stock market derivatives market EUREX-SMI rate next nearest to maturity	EUREX Deutschland via Thomson Reuters Datastream	EUREX-SMI TRC4
O131	Oil Futures rate nearest to maturity	NYMEX via Thomson Reuters Datastream	NYMEX-Crude Oil Futures TRC1
O132	Gas Future rate nearest to maturity	NYMEX via Thomson Reuters Datastream	NYMEX-Henry Hub Natural Gas Futures TRC1
O133	Gold Future rate nearest to maturity	NYMEX COMEX Division via Thomson Reuters Datastream	CMX-Gold 100 oz TRC1
O134	Copper Future rate nearest to maturity	NYMEX COMEX Division via Thomson Reuters Datastream	CMX-High Grade Copper TRC1
O135	Soybeans Future rate nearest to maturity	eCBOT via Thomson Reuters Datastream	CBT-Soybeans Composite TRC1
O136	Wheat Future rate nearest to maturity	eCBOT via Thomson Reuters Datastream	CBT-Wheat Composite TRC1
O137	Corn Future rate nearest to maturity	eCBOT via Thomson Reuters Datastream	CBT-Corn Composite TRC1
O138	Aluminium Future rate nearest to maturity	London Metal Exchange via Thomson Reuters Datastream	LME-Aluminium TRC1
O139	Oil Future next nearest to maturity	NYMEX via Thomson Reuters Datastream	NYMEX-Crude Oil Futures TRC4
O140	Gas Future next nearest to maturity	NYMEX via Thomson Reuters Datastream	NYMEX-Henry Hub Natural Gas Futures TRC4
O141	Gold Future next nearest to maturity	NYMEX COMEX Division via Thomson Reuters Datastream	CMX-Gold 100 oz TRC4
O142	Copper Future next nearest to maturity	NYMEX COMEX Division via Thomson Reuters Datastream	CMX-High Grade Copper TRC4
O143	Soybeans Future next nearest to maturity	eCBOT via Thomson Reuters Datastream	CBT-Soybeans Composite TRC4
O144	Wheat Future next nearest to maturity	eCBOT via Thomson Reuters Datastream	CBT-Wheat Composite TRC4
O145	Corn Future next nearest to maturity	eCBOT via Thomson Reuters Datastream	CBT-Corn Composite TRC4
O146	Aluminium Future next nearest to maturity	London Metal Exchange via Thomson Reuters Datastream	LME-Aluminium TRC4
O147	Deposit volume of the banking sector of South Korea	The Bank of Korea	Deposits: Commercial and Specialized Banks (CSB): Total
O148	Deposit volume of the banking sector of US	Federal Reserve	Domestic Banks: sa: Deposits
O149	Loan volume of the banking sector of South Korea	The Bank of Korea	Loans of Commercial and Specialized Banks (CSB): Total
O150	Loan volume of the banking sector of US	Federal Reserve	Domestic Banks: Credit: Loans and Lease (LL)
O151	Total liabilities of the banking sector of Canada	Statistics Canada	Chartered Bank: Month End: Liabilities
O152	Total liabilities of the banking sector of France	Bank of France	MFIs: Liabilities: Total
O153	Total liabilities of the banking sector of India	Reserve Bank of India	Commercial Banks: Liabilities: Banking System (BS)
O154	Total liabilities of the banking sector of UK	Bank of England	MFIs: Liabilities
O155	Total liabilities of the banking sector of US	Federal Reserve	US Commercial Bank Liabilities - Total
O156	M1 of Canada	Bank of Canada	CN MONEY SUPPLY M1 PLUS GROSS CURN
O157	M1 of France	Banque de France	France, Money Supply Money Supply M1, Euro
O158	M1 of India	Reserve Bank of India	India, Money Supply Money Supply M1 (EP), INR
O159	M1 of UK	Bank of England	Money Supply M1
O160	M1 of US	Federal Reserve	US Money Supply M1

O161	Consumer Price Index of Belgium	OECD, Main economic indicators	BG CPI ALL ITEMS NADJ
O162	Consumer Price Index of Brazil	OECD, Main economic indicators	BR CPI ALL ITEMS NADJ
O163	Consumer Price Index of Canada	OECD, Main economic indicators	CN CPI ALL ITEMS NADJ
O164	Consumer Price Index of PRC	OECD, Main economic indicators	CH CONSUMER PRICES: ALL ITEMS NADJ
O165	Consumer Price Index of France	OECD, Main economic indicators	FR ALL ITEMS NADJ
O166	Consumer Price Index of Germany	OECD, Main economic indicators	BD DEU CPI ALL ITEMS NADJ
O167	Consumer Price Index of India	OECD, Main economic indicators	IN CONSUMER PRICES: ALL ITEMS NADJ
O168	Consumer Price Index of Indonesia	OECD, Main economic indicators	ID CONSUMER PRICES: ALL ITEMS NADJ
O169	Consumer Price Index of Italy	OECD, Main economic indicators	IT CPI ALL ITEMS NADJ
O170	Consumer Price Index of Japan	OECD, Main economic indicators	JP CPI ALL ITEMS NADJ
O171	Consumer Price Index of Malaysia	DEPARTMENT OF STATISTICS, MALAYSIA	MY CPI NADJ
O172	Consumer Price Index of Netherlands	OECD, Main economic indicators	NL CPI ALL ITEMS NADJ
O173	Consumer Price Index of Philippines	OECD, Main economic indicators	PH CPI NADJ
O174	Consumer Price Index of Russia	OECD, Main economic indicators	RS CPI ALL ITEMS NADJ
O175	Consumer Price Index of South Korea	OECD, Main economic indicators	KO CPI ALL ITEMS NADJx
O176	Consumer Price Index of Singapore	STATISTICS SINGAPORE	SP CPI NADJ
O177	Consumer Price Index of Spain	OECD, Main economic indicators	ES CPI ALL ITEMS NADJ
O178	Consumer Price Index of TPC	DGBAS, TPC	TW CPI NADJ
O179	Consumer Price Index of Thailand	BUREAU OF TRADE & ECON. INDICES,THAILAND	TH CPI NADJ
O180	Consumer Price Index of UK	OECD, Main economic indicators	UK CPI ALL ITEMS NADJ
O181	Consumer Price Index of US	OECD, Main economic indicators	US CPI All items NADJ
O182	GDP of PRC (quarterly)	National Bureau of Statistics of PRC	Gross Domestic Product, Current Quarter(100 million yuan)
O183	Industrial Production of PRC	National Bureau of Statistics of PRC	Real growth rate of value added of industry year-on-year
O184	M1 of PRC	The People's Bank of PRC	Narrow money
O185	1-year deposit rate	The People's Bank of China	Time Deposit Rate: 1Y (Lump-sum Deposit and Withdrawal)
O186	GDP of TPC	Ministry of Economic Affairs. TPC	TW GDP
O187	Industrial Production of TPC	Ministry of Economic Affairs. TPC	TW IP
O188	M1 of TPC	Central Bank of the Republic of China (TPC)	TW MONEY SUPPLY – M1A (end of period)
O189	TPC discount rate	Central Bank of the Republic of China (TPC)	TW, Policy Rates, Discount Rate (end of period)

Table A3. Input indicator construction

	Ind.	Indicator Description	Construction
Stock Market*	I1	Ratio of SMI: Australia/PRC	O19*O39/O43*O23
	I2	Ratio of SMI: Belgium/PRC	O20*O40/O43*O23
	I3	Ratio of SMI: Brazil/PRC	O21*O41/O43*O23
	I4	Ratio of SMI: Canada/PRC	O22*O42/O43*O23
	I5	Ratio of SMI: France/PRC	O24*O44/O43*O23
	I6	Ratio of SMI: Germany/PRC	O25*O45/O43*O23
	I7	Ratio of SMI: India/PRC	O26*O46/O43*O23
	I8	Ratio of SMI: Indonesia/PRC	O27*O47/O43*O23
	I9	Ratio of SMI: Italy/PRC	O28*O48/O43*O23
	I10	Ratio of SMI: Japan/PRC	O29*O49/O43*O23
	I11	Ratio of SMI: Malaysia/PRC	O30*O50/O43*O23
	I12	Ratio of SMI: Netherlands/PRC	O31*O51/O43*O23
	I13	Ratio of SMI: Philippines/PRC	O32*O52/O43*O23
	I14	Ratio of SMI: Singapore/PRC	O33*O53/O43*O23
	I15	Ratio of SMI: Spain/PRC	O34*O54/O43*O23
	I16	Ratio of SMI: South Korea/PRC	O35*O55/O43*O23
	I17	Ratio of SMI: TPC/PRC***	O36*O56/O43*O23
	I18	Ratio of SMI: Thailand/PRC	O37*O57/O43*O23
	I19	Ratio of SMI: UK/PRC	O38*O58/O43*O23
	I20	Ratio of SMI: US/PRC	O59/O43*O23
Futures Market	I21	Derivatives market: FTSE100	O124-O117
	I22	Derivatives market: HANG SENG	O125-O118
	I23	Derivatives market: TOPIX	O126-O119
	I24	Derivatives market: S&P 500	O127-O120
	I25	Derivatives market: EUREX-DAX	O128-O121
	I26	Derivatives market: AEX	O129-O122
	I27	Derivatives market: EUREX-SMI	O130-O123
	I28	Derivatives market: Oil	O139-O131
	I29	Derivatives market: Gas	O140-O132
	I30	Derivatives market: Gold	O141-O133
	I31	Derivatives market: Copper	O142-O134
	I32	Derivatives market: Soybeans	O143-O135
	I33	Derivatives market: Wheat	O144-O136
	I34	Derivatives market: Corn	O145-O137
	I35	Derivatives market: Aluminium	O146-O138
Bond Market	I36	TB spread: 10-to-2 years of Australia	O71-O68
	I37	TB spread: 10-to-1 years of Belgium	O72-O60
	I38	TB spread: 10-to-1 years of Canada	O73-O61
	I39	TB spread: 10-to-1 years of France	O74-O62
	I40	TB spread: 10-to-1 years of Germany	O75-O63
	I41	TB spread: 10-to-1 years of Italy	O76-O64
	I42	TB spread: 10-to-2 years of Japan	O77-O69
	I43	TB spread: 10-to-1 years of Malaysia	O78-O65
	I44	TB spread: 10-to-1 years of Spain	O79-O66
	I45	TB spread: 10-to-2 years of UK	O80-O70
	I46	TB spread: 10-to-1 years of US	O81-O68
	I47	TB spread: 20-to-10 years of Canada	O82-O73
	I48	TB spread: 30-to-10 years of France	O88-O74
	I49	TB spread: 20-to-10 years of Japan	O83-O77
	I50	TB spread: 20-to-10 years of UK	O84-O80
	I51	TB spread: 30-to-10 years of Germany	O86-O75
	I52	TB spread: 30-to-10 years of Spain	O87-O79
	I53	TB spread: 30-to-10 years of US	O89-O81
	I54	TB spread: 20-to-1 years of Canada	O82-O61
	I55	TB spread: 20-to-1 years of US	O85-O67
	I56	TB spread: 30-to-1 years of France	O88-O62
	I57	TB spread: 30-to-1 years of Germany	O86-O63
	I58	TB spread: 30-to-1 years of Spain	O87-O66
	I59	TB spread: 20-to-2 years of Japan	O83-O69
	I60	TB spread: 20-to-2 years of UK	O84-O70

Table A3. Input indicator construction (cont.)

Money Market	**I61**	TED spread: interbank loan to TB rates of Belgium	O90-O10
	I62	TED spread: interbank loan to TB rates of Canada	O91-O11
	I63	TED spread: interbank loan to TB rates of France	O92-O12
	I64	TED spread: interbank loan to TB rates of Italy	O93-O13
	I65	TED spread: interbank loan to TB rates of Spain	O94-O15
	I66	TED spread: interbank loan to TB rates of UK	O95-O17
	I67	TED spread: interbank loan to TB rates of US	O96-O18
	I68	IR spread: Overnight to 3-month interbank of Australia	O9-O1
	I69	IR spread: Overnight to 3-month interbank of Belgium	O10-O2
	I70	IR spread: Overnight to 3-month interbank of Canada	O11-O3
	I71	IR spread: Overnight to 3-month interbank of Italy	O13-O4
	I72	IR spread: Overnight to 3-month interbank of Japan	O14-O5
	I73	IR spread: Overnight to 3-month interbank of Spain	O15-O6
	I74	IR spread: Overnight to 3-month interbank of TPC**	O16-O7
	I75	IR spread: Overnight to 3-month interbank of US	O18-O8
	I76	TB spread: 6-to-3 months of Belgium	O97-O90
	I77	TB spread: 6-to-3 months of Canada	O98-O91
	I78	TB spread: 6-to-3 months of France	O99-O92
	I79	TB spread: 6-to-3 months of Italy	O100-O93
	I80	TB spread: 6-to-3 months of Spain	O101-O94
	I81	TB spread: 6-to-3 months of US	O102-O96
Banking Sector	**I82**	Total lending to deposit ratio of the banking sector of US	O150-O148
	I83	Total lending to deposit ratio of the banking sector of South Korea	O149-O147
	I84	IR spread: lending-to-deposit rates of Australia	O110-O103
	I85	IR spread: lending-to-deposit rates of Canada	O111-O104
	I86	IR spread: lending-to-deposit rates of Indonesia	O112-O105
	I87	IR spread: lending-to-deposit rates of Japan	O113-O106
	I88	IR spread: lending-to-deposit rates of Malaysia	O114-O107
	I89	IR spread: lending-to-deposit rates of South Korea	O115-O108
	I90	IR spread: lending-to-deposit rates of Thailand	O116-O109
	I91	Debt to liquidity ratio: M1 to liabilities of Canada	O156-O151
	I92	Debt to liquidity ratio: M1 to liabilities of France	O157-O152
	I93	Debt to liquidity ratio: M1 to liabilities of India	O158-O153
	I94	Debt to liquidity ratio: M1 to liabilities of UK	O159-O154
	I95	Debt to liquidity ratio: M1 to liabilities of US	O160-O155
Foreign Exchange Market*	**I96**	PPP: Belgium/PRC	O161/O164
	I97	PPP: Brazil/PRC	O162/O164
	I98	PPP: Canada/PRC	O163/O164
	I99	PPP: France/PRC	O165/O164
	I100	PPP: Germany/PRC	O166/O164
	I101	PPP: India/PRC	O167/O164
	I102	PPP: Indonesia/PRC	O168/O164
	I103	PPP: Italy/PRC	O169/O164
	I104	PPP: Japan/PRC	O170/O164
	I105	PPP: Malaysia/PRC	O171/O164
	I106	PPP: Netherlands/PRC	O172/O164
	I107	PPP: Philippines/PRC	O173/O164
	I108	PPP: Russia/PRC	O174/O164
	I109	PPP: South Korea/PRC	O175/O164
	I110	PPP: Singapore/PRC	O176/O164
	I111	PPP: Spain/PRC	O177/O164
	I112	PPP: TPC/PRC***	O178/O164
	I113	PPP: Thailand/PRC	O179/O164
	I114	PPP: UK/PRC	O180/O164
	I115	PPP: US/PRC	O181/O164

Notes: Stock market indices (SMI), treasury bond (TB), interest rate (IR). The corresponding variables used for the indicator construction can be found in the Appendix Table A2. * Construction differs for TPC with PRC Stock Market and CPI being replaced by TPC Stock Market and CPI. ** Dropped from the TPC input indicator set. *** Ratio inverted for TPC.

Appendix C – Grouping Results and Weights

Table A4. Grouping results

		PRC		TPC	
	Indicators	**Construction**	**Grouped Input Indicators**	**Construction**	**Grouped Input Indicators**
Money Market	**I76**	average	g1	average	g1
	I78	average		average	
	I79	average		average	
	I81	average	g2	average	g2
	I74**	average		dropped	
	I61	average	g3	average	g3
	I62	average		average	
	I63	average		average	
	I65	average		average	
	I66	average		average	
	I69	average	g4	average	g4
	I73	average		average	
	I77	full	g5	full	g5
	I64	full	g6	full	g6
	I67	full	g7	full	g7
	I68	full	g8	full	g8
	I70	full	g9	full	g9
	I71	full	g10	full	g10
	I72	full	g11	full	g11
	I75	full	g12	full	g12
	I80	full	g13	full	g13
Bond Market	**I37**	average	g1	average	g1
	I39	average		average	
	I40	average		average	
	I44	average		average	
	I48	average		average	
	I51	average		average	
	I56	average		average	
	I57	average		average	
	I45	average	g2	average	g2
	I50	average		average	
	I60	average		average	
	I46	average	g3	average	g3
	I53	average		average	
	I55	average		average	
	I42	average	g4	average	g4
	I59	average		average	
	I38	average	g5	average	g5
	I54	average		average	
	I36	full	g6	full	g6
	I41	full	g7	full	g7
	I43	full	g8	full	g8
	I47	full	g9	full	g9
	I49	full	g10	full	g10
	I52	full	g11	full	g11
	I58	full	g12	full	g12
Banking Sector	**I85**	average	g1	average	g1
	I82	average		average	
	I89	average	g2	average	g2
	I90	average		average	
	I91	average	g3	average	g3
	I95	average		average	
	I84	full	g4	full	g4
	I83	full	g5	full	g5
	I93	full	g6	full	g6
	I86	full	g7	full	g7
	I87	full	g8	full	g8
	I88	full	g9	full	g9
	I94	full	g10	full	g10
	I92	full	g11	full	g11

Table A4. Grouping results (cont.)

Foreign Exchange Market*	I96	average	g1	average	g1
	I101	average		average	
	I102	average		average	
	I107	average		average	
	I108	average		average	
	I96	average	g2	average	
	I98	average		average	
	I99	average		average	
	I100	average		average	
	I103	average		average	
	I105	average		average	
	I106	average		average	
	I109	average		average	
	I111	average		average	
	I112	average		average	
	I113	average		average	
	I114	average		average	
	I115	average		average	
	I104	average		full	g2
	I110	average		full	g3
Stock Market*	I1	average	g1	average	g1
	I3	average		average	
	I4	average		average	
	I7	average		average	
	I14	average		average	
	I16	average		average	
	I2	average		average	g2
	I5	average		average	
	I6	average		average	
	I9	average		average	
	I12	average		average	
	I15	average		average	
	I19	average		average	
	I10	average		full	g4
	I20	average		full	g5
	I17	average		average	g3
	I11	average		average	
	I8	full	g2	average	
	I18	full	g3	average	
	I13	full	g4	average	
Futures Market	I28	average	g1	average	g1
	I29	average		average	
	I30	average	g2	average	g2
	I32	average		average	
	I34	average		average	
	I21	average	g3	average	g3
	I24	average		average	
	I25	average		average	
	I27	average		average	
	I22	full	g4	full	g4
	I31	full	g5	full	g5
	I33	full	g6	full	g6
	I35	full	g7	full	g7
	I23	full	g8	full	g8
	I26	full	g9	full	g9

Note: * Definition of indicators differs between PRC and TPC. ** Dropped for TPC.

Table A5. PRC short-run CIFI weights

						2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bank	g4	Total Liability to Equity Ratio & Interest Spread Lending to Deposit Rate	AU	1						-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
				2							0.01	0.01				0.01
	g2		KR,TH	1		0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	
				2	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	
	g8		JP	1	0.04	0.04	0.03	0.03	0.03		0.03		0.02	0.02	0.02	
				2	-0.03	-0.03	-0.03		-0.02							
	g9		MY	1											-0.01	-0.01
				2											0.02	0.02
	g3	M1 - Liquidity Ratio	US,CA	1	0.04	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05	
				2	-0.04	-0.06	-0.05	-0.06	-0.05	-0.06	-0.06	-0.05	-0.05	-0.05	-0.04	
	g10		UK	1	-0.02	-0.02	-0.01		-0.01	-0.01	-0.01	-0.01				
				2	0.02	0.01										
	g11		FR	1	0.01	0.01	0.01	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	
				2	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	
				3					-0.02	-0.03	-0.03					
	g6		IN	1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
				2								-0.01	-0.01	-0.01		
Bond	g3	Government Bond Spread (10-1 Year, 30-10 Years, 30-1 Year)	US	1	-0.02			-0.02								
				2	0.02	0.02	0.02	0.02								
	g5		CA	1						0.01	0.01	0.01	0.01	0.01	0.01	
	g2		UK	1				-0.02								
				2				0.02								
	g7		IT	1								0.01				
	g11		ES	1	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.03	-0.03	-0.03	-0.02	
				2	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	
				3									-0.02			-0.01
	g6		AU	1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
	g4		JP	1											0.01	
FX	g2	PPP	Others *	1				0.04		0.03	0.03					0.01
Futures	g1	Commodities Calendar Spread	Oil,Gas	1	0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
	g2		Gold,Soy,Corn	1	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
				2	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	0.00		
	g5		Copper	1	-0.01	-0.01										
				2	0.01	0.01										
	g6		Wheat	1	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	
				2	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
	g7		Aluminium	1			0.01						0.01	0.01	0.01	
	g3	Stocks Calendar Spread	FTSE,S&P,EUR	1												0.01
	g4		Hang Seng	1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
				2	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00		
	g9		AEX	1	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	
				2	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	
Money	g2	3 Month - 6 Months T-bill Spread	US,TW	1	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	
				2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	
	g5		CA	1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
	g1		BE,FR,IT	1												0.00
	g13		ES	1	0.01	0.01	0.01	0.01		0.01	0.01	-0.01	-0.01	-0.01	-0.01	
	g7	TED Spread	US	1	-0.02	-0.02	-0.01	-0.01			-0.03	-0.02	-0.03	-0.03	-0.03	
				2	0.01	0.01	0.01	0.01			0.03	0.02	0.02	0.02		
	g3		CA,BE,FR,ES,UK	1	-0.01	-0.01	-0.01									
				2	0.01	0.01	0.01	0.01								
	g6		IT	1	-0.01	-0.01	-0.01	-0.01		0.00	-0.01	-0.01	-0.01	-0.01	-0.01	
				2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			
	g12	Overnight - 3 Month Interbank Rate Spread	US	1	-0.02	-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	
				2	0.01	0.01	0.01	0.01								
	g4		BE,ES	1	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.01	0.01	0.01		
				2	0.01	0.01	0.01	0.01	0.01			-0.01	-0.01	-0.01	-0.01	
	g10		IT	1	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	
				2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
	g8		AU	1			-0.01			-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	
				2						0.01	0.01	0.01	0.01	0.01	0.01	
	g11		JP	1	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01		
				2	-0.01	-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	
Stock	g1	Cross Market Ratio	Others **	1	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	
				2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	
	g2		ID	1				-0.01	-0.01				-0.01	-0.01	-0.01	-0.01
				2				0.01	0.01	0.01						
	g3		TH	1									-0.02	-0.02		-0.02
				2									0.02	0.02		0.02
	g4		PH	1	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
				2	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	

Notes: Input indicators with no significant weights have been excluded from the table. The coloured bar to the left indicates whether the input indicator enters with an overall positive (blue) or negative (red) sign. Number of lags indicate whether the input indicator enters as a difference or a level. Input indicator references, e.g. g1, g2, etc, correspond to the grouping results in Table 3A.* CA, DE, IT, JP, MY, NL, KR, SG, ES, TW, TH, UK, US. ** AU, BR, CA, DE, IN, IT, JP, MY, NL, SG, ES, KR, TW, UK, US. See Table A13 for country shorthand.

Table A6. PRC short-run CIFI lags

					2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bank	g4	Total Liability to Equity Ratio & Interest Spread Lending to Deposite Rate	AU	1					1	1	1	1	1	1	1
				2						6	6				6
	g2		KR,TH	1		1	1		1	1	1	1	1	1	
				2	3	3	3	3	3	3	3	3	3	3	3
	g8		JP	1	3	3	4	4	4		5		4	4	4
				2	6	6	6		6						
	g9		MY	1										1	1
				2										4	4
	g3	M1 - Liquidity Ratio	US,CA	1	1	1	1	1	1	1	1	1	1	1	1
				2	6	3	4	4	4	4	4	4	4	3	4
	g10		UK	1	1	1	6		6	6	6	6			
				2	3	3									
	g11		FR	1	1	1	1	1	1	1	1	1	1	1	1
				2	3	3	3	3	3	3	3	3	4	3	3
				3					4	4	4				
	g6		IN	1	3	3	3	3	3	3	3	3			
				2								5	6	5	
Bond	g3	Government Bond Spread (10-1 Year, 30-10 Years, 30-1 Year)	US	1	2			2							
				2	4	4	4	4							
	g5		CA	1						4	4	4	4	4	4
	g2		UK	1				2							
				2				4							
	g7		IT	1							6				
	g11		ES	1	1	1	1	1	1	1	1	1	1	1	1
				2	3	3	3	3	3	3	3	3	3	3	3
				3								5			5
	g6		AU	1	6	6	6	6	6	6	6	6	6	5	6
	g4		JP	1										1	
FX	g2	PPP	Others *	1				2		2	2				2
Futures	g1	Commodities Calendar Spread	Oil,Gas	1	3			3	6	6	6	6	6	6	6
	g2		Gold,Soy,Corn	1	4	4	4	4	4	4	4	4	1	1	1
				2	6	6	6	6	6	6	6	6	6	6	
	g5		Copper	1	1	1									
				2	4	4									
	g6		Wheat	1	1	1	1	1	1	1	1	1	1	1	1
				2	5	5	5	5	5	5	6	5	5	5	5
	g7		Aluminium	1			3					3	3	3	3
	g3	Stocks Calendar Spread	FTSE,S&P,EUR	1											2
	g4		Hang Seng	1	1	1	1	1	1	1	1	1	1	1	1
				2	4	4	4	4	4	4	4	4	4	4	
	g9		AEX	1	1	1	1	1	1	1	1	1	1	1	1
				2	5	5	5	5	5	5	5	5	5	5	5
Money	g2	3 Month - 6 Months T-bill Spread	US,TW	1	1	1	1	1	1	1	1	1	1	1	1
				2	4	4	4	4	4	4	4	4	4	4	4
	g5		CA	1	1	1	1	1	1	1	1	1	1	1	1
	g1		BE,FR,IT	1											1
	g13		ES	1	1	1	1	1		1	1	5	3	4	4
	g7	TED Spread	US	1	1	1	1	2			3	2	2	2	2
				2	6	6	6	6			5	5	5	5	
	g3		CA,BE,FR,ES,UK	1	1	1	1								
				2	3	3	3	6							
	g6		IT	1	1	1	1	1		1	1	1	1	1	1
				2	4	4	4	4	5	4	4	5	4		
	g12	Overnight - 3 Month Interbank Rate Spread	US	1	2	2	2	2		6	6	6	6	6	6
				2	5	5	5	4							
	g4		BE,ES	1	3	3	3	3	3	3	3	1	1	1	
				2	6	6	6	6	6			3	3	3	3
	g10		IT	1	3	3	3	3	3	3	3	3	3	3	3
				2	6	6	6	6	6	6	6	6	6	6	6
	g8		AU	1			2			2	2	2	2	2	1
				2						4	4	4	4	4	4
	g11		JP	1	3	3	3	3		3	3	3	3	3	
				2	6	6	6	6		6	6	6	6	6	6
Stock	g1	Cross Market Ratio	Others **	1	2	2	1	1	1	1	1	1	1	1	1
				2	6	6	6	6	6	6	6	6	6	6	6
	g2		ID	1				2	2			2	2	2	2
				2				6	6	6					
	g3		TH	1								2	2		2
				2								4	4		4
	g4		PH	1	2	2	2	3	2	2	2	2	2	2	2
				2	6	6	6	6	6	6	6	6	6	6	6

Notes: Input indicators with no significant weights have been excluded from the table. Number of lags indicate whether the input indicator enters as a difference or a level. Input indicator references, e.g. g1, g2, etc, correspond to the grouping results in Table 3A.* CA, DE, IT, JP, MY, NL, KR, SG, ES, TW, TH, UK, US. ** AU, BR, CA, DE, IN, IT, JP, MY, NL, SG, ES, KR, TW, UK, US. See Table A13 for country shorthand.

Table A7. TPC short-run CIFI weights

					2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bank	g4	Total Liability to Equity Ratio & Interest Spread Lending to Deposit Rate	AU	1							0.02				
	g8		JP	1	-0.04										
	g5		KR	1	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03
				2	-0.04	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
	g9		MY	1	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03
				2	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
	g3	M1 - Liquidity Ratio	US,CA	1			0.11	0.10		0.10	0.10	0.05	0.04	0.04	
				2			-0.11	-0.10		-0.10	-0.10	-0.04	-0.04	-0.04	
	g11		FR	1	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04
				2	-0.04	-0.04	-0.04	-0.04	-0.06	-0.06	-0.06	-0.06	-0.04	-0.04	-0.04
				3	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.04	0.04
	g6		IN	1	0.02	0.02	0.02	0.02	0.02	0.02		0.02	0.02	0.02	0.02
				2	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02		-0.02	-0.02	-0.02	-0.02
Bond	g3	Government Bond Spread (10-1 Year, 30-10 Years, 30-1 Year)	US	1	0.02	0.02									
	g5		CA	1				0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02
				2				-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
	g2		UK	1	-0.02	-0.02	-0.02	-0.03							
				2	0.03	0.03	0.02	0.04	0.01	0.02	0.02	0.02	0.02	0.02	0.01
	g7		IT	1					0.01	0.02	0.02	0.02			
				2								-0.01			
	g11		ES	1	-0.03		-0.04	-0.04	-0.03			-0.03	-0.03	-0.03	-0.02
				2	0.04		0.04	0.04	0.04			0.03	0.03	0.03	0.03
	g6		AU	1	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01		
				2	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01
	g8		MY	1						0.01					
Forex	g1	PPP	Others*	1	-0.11							-0.11	-0.11	-0.11	-0.12
				2	0.12							0.12	0.11	0.12	0.12
	g2		JP	1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07
				2	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07
	g3		SG	1	0.01					0.01	0.03	0.04	0.04	0.05	0.06
				2							-0.03	-0.04	-0.04	-0.05	-0.05
Futures	g2	Commodities Calendar Spread	Gold, Soy, Corn	1				0.02	0.02						
				2	-0.01	-0.01		-0.03	-0.02		-0.01	-0.01	-0.01	-0.01	-0.01
	g5		Copper	1	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
				2	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01
	g6		Wheat	1	-0.03	-0.03	-0.03	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
				2	0.03	0.03	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.02
	g7		Aluminium	1			-0.01	-0.01				-0.01	-0.01	-0.01	-0.01
				2										0.01	0.01
	g3	Stocks Calendar Spread	FTSE,S&P,EUR	1	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
				2							0.01	0.01	0.01	0.01	0.01
	g4		Hang Seng	1	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
				2	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01
	g9		AEX	1	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
				2	-0.02	-0.02	-0.01	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Money	g2	3 Month - 6 Months T-bill Spread	US	1	0.03	0.03	0.03	0.03	0.04	0.05	0.06	0.06	0.06	0.07	0.07
				2	-0.02	-0.02	-0.02	-0.03	-0.04	-0.05	-0.06	-0.06	-0.07	-0.07	-0.07
	g5		CA	1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
				2	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	g13		ES	1							0.01				
				2	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	g7	TED Spread	US	1	-0.02	-0.02	-0.02	-0.02	-0.02						
				2	0.03	0.03	0.03	0.02	0.03						
	g6		IT	1	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
				2	0.01	0.01	0.01	0.01							
	g12	Overnight - 3 Month Interbank Rate Spread	US	1	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01
				2	0.03	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	g4		BE,ES	1				-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
				2	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
	g10		IT	1					0.02	0.02	0.01	0.01	0.01	0.01	0.01
				2	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01
				3					-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01
				4	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01
	g8		AU	1	-0.02	-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
				2	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	g11		JP	1	0.02	0.02	0.02	0.01							
				2			-0.01								
Stock	g1	Cross Market Ratio	AU,BR,CA,IN,SG,KR	1		-0.03	-0.05	-0.04							
				2	0.03	0.04	0.05	0.04	0.04	0.04					
	g2		BE,FR,DE,IT,NL,ES,UK	1		-0.02	-0.03	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
				2		0.03	0.03	0.02	0.04	0.04	0.03	0.03	0.03	0.03	0.03
	g3		CH,ID,MY,PH,TH	1							0.02		0.02	0.02	0.02
	g4		JP	1	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
				2	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	g5		US	1	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02
				2	0.03	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Notes: See Table A5. * BE, BR, CA, FR, DE, IN, ID, IT, MY, NL, PH, RU, KR, ES, TH, UK, US, CH. See Table A13 for country shorthand.

Table A8. TPC Short-run CIFI Lags

					2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bank	g4	Total Liability to Equity Ratio & Interest Spread Lending to Deposit Rate	AU	1							6				
	g8		JP	1	1										
	g5		KR	1	3	3	3	3	3	3	3	3	3	3	3
				2	6	6	6	6	6	6	6	6	6	6	6
	g9		MY	1	1	1	1	1	1	1	1	1	1	1	1
				2	2	2	2	2	2	2	2	2	2	2	2
	g3	M1 - Liquidity Ratio	US,CA	1			2	2		1	1	1	1	1	
				2			5	5		3	3	2	2	2	
	g11		FR	1	1	1	1	1	1	1	1	1	1	1	1
				2	3	3	3	3	3	3	3	3	3	3	3
				3	6	6	6	6	6	6	6	6	6	6	6
	g6		IN	1	3	3	3	3	3	1		3	3	2	2
				2	5	5	5	5	5	5		5	5	5	5
Bond	g3	Government Bond Spread (10-1 Year, 30-10 Years, 30-1 Year)	US	1	3	3									
	g5		CA	1				4	4	4	4	4	4	4	4
				2				6	6	6	6	6	6	6	6
	g2		UK	1	1	1	1	1							
				2	6	6	6	4	6	6	6	6	6	6	6
	g7		IT	1					2	2	2	2			
				2								4			
	g11		ES	1	1		2	2	2			1	1	1	1
				2	4		4	4	4			4	4	4	4
	g6		AU	1	1	1	1	1	1	1	1	1	1		
				2	4	4	4	4	4	4	4	4	4	4	4
	g8		MY	1						3					
Forex	g1	PPP	Others*	1	2							2	2	2	2
				2	5							5	5	5	5
	g2		JP	1	3	3	3	3	3	3	3	3	3	3	3
				2	4	4	4	4	4	4	4	4	4	4	4
	g3		SG	1	1					1	1	1	1	1	1
				2							2	2	2	2	2
Futures	g2	Commodities Calendar Spread	Gold, Soy, Corn	1				4	4						
				2	6	6		6	6		6	6	6	6	6
	g5		Copper	1	1	2	2	3	2	3	3	2	2	2	2
				2	4	4	4	4	4	4	4	4	4	4	4
	g6		Wheat	1	3	3	3	3	3	3	3	3	3	4	4
				2	5	5	5	6	6	6	6	6	6	6	6
	g7		Aluminium	1			1	1				1	1	1	1
				2										5	5
	g3	Stocks Calendar Spread	FTSE,S&P,EUR	1	1	1	1	1	1	1	1	1	1	1	1
				2							5	5	5	5	5
	g4		Hang Seng	1	1	2	2	2	2	2	2	2	2	2	2
				2	4	4	5	5	5	5	5	5	5	5	5
	g9		AEX	1	1	1	1	1	1	1	1	1	1	1	1
				2	5	5	5	2	5	5	5	5	5	5	5
Money	g2	3 Month - 6 Months T-bill Spread	US	1	2	2	2	2	2	2	2	2	2	2	2
				2	4	4	4	4	4	4	4	4	4	4	4
	g5		CA	1	1	1	1	1	1	1	1	1	1	1	1
				2	4	4	4	4	4	4	4	4	4	4	4
	g13		ES	1							1				
				2	3	3	3	3	3	3	5	5	5	5	5
	g7	TED Spread	US	1	3	3	3	3	3						
				2	6	6	6	6	6						
	g6		IT	1	1	1	1	1	1	1	1	1	1	1	1
				2	4	4	4	4							
	g12	Overnight - 3 Month Interbank Rate Spread	US	1	2	2	2	2	2	2	2	2	2	2	2
				2	5	5	5	5	5	5	5	5	5	5	5
	g4		BE,ES	1				3	3	3	3	3	3	3	3
				2	6	6	6	6	6	6	6	6	6	6	6
	g10		IT	1					1	1	1	1	1	1	1
				2	3	3	3	3	3	3	3	3	3	3	3
				3					4	4	4	4	4	4	4
				4	6	6	6	6	6	6	6	6	6	6	6
	g8		AU	1	2	2	2	2		2	2	2	2	2	2
				2	5	5	5	5	5	5	5	5	5	5	5
	g11		JP	1	3	3	5	3							
				2			6								
Stock	g1	Cross Market Ratio	AU,BR,CA,IN,SG,KR	1		1	1	1							
				2	3	3	3	3	3	3					
	g2		BE,FR,DE,IT,NL,ES,UK	1		1	1	1	1	1	1	1	1	1	1
				2		3	3	3	2	2	2	2	2	2	2
	g3		CH,ID,MY,PH,TH	1							3		3	3	3
	g4		JP	1	1	1	1	1	1	1	1	1	1	1	1
				2	3	3	3	3	3	3	3	3	3	3	3
	g5		US	1	1	1	1	1	1	1	1	1	1	1	1
				2	3	3	3	3	3	3	3	3	3	3	3

Notes: See Table A6. * BE, BR, CA, FR, DE, IN, ID, IT, MY, NL, PH, RU, KR, ES, TH, UK, US, CH. See Table A13 for country shorthand.

Table A9. PRC long-run CIFI weights

				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bank	g1	Total Liability to Equity Ratio & Interest Spread Lending to Deposit Rate	US,CA	0.07	0.07	0.08	0.09	0.08	0.04	0.02	-0.01	-0.02	-0.02	-0.02
	g4		AU	0.04	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.06
	g2		KR,TH	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	g5		KR	-0.05	-0.04	-0.03	0.01	0.02	0.03	0.04	0.04	0.04	0.04	0.04
	g8		JP	-0.11	-0.10	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11
	g9		MY	-0.01	-0.02	-0.02	-0.02	-0.02	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06
	g3	M1 - Liquidity Ratio	US,CA	-0.08	-0.08	-0.09	-0.10	-0.10	-0.10	-0.09	-0.09	-0.08	-0.08	-0.08
	g10		UK	0.11	0.11	0.11	0.11	0.10	0.08	0.07	0.06	0.06	0.06	0.05
	g11		FR	0.11	0.11	0.10	0.07	0.04	-0.02	-0.03	-0.04	-0.04	-0.03	-0.03
	g6		IN	-0.06	-0.06	-0.05	-0.04	-0.04	0.03	0.05	0.05	0.06	0.06	0.06
Bond	g3	Government Bond Spread (10-1 Year, 30-10 Years, 30-1 Year)	US	0.08	0.07	0.05	0.06	0.06	0.08	0.09	0.09	0.09	0.09	0.09
	g5		CA	0.02	0.02	0.00	-0.01	0.00	0.02	0.03	0.03	0.02	0.03	0.03
	g2		UK	-0.03	-0.03	-0.04	-0.04	-0.03	0.03	0.05	0.05	0.06	0.06	0.06
	g1		BE,FR,DE,ES	-0.03	-0.04	-0.05	-0.05	-0.05	-0.02	0.00	0.01	0.01	0.02	0.02
	g7		IT	-0.02	-0.02	-0.03	-0.04	-0.03	0.01	0.02	0.04	0.04	0.04	0.04
	g11		ES	0.09	0.09	0.09	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11
	g6		AU	-0.08	-0.08	-0.09	-0.09	-0.08	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04
	g4		JP	-0.09	-0.09	-0.09	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
	g8		MY	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05
FX	g1	PPP	BR,IN,ID,PH,RU	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.12
	g2		Others *	0.06	0.07	0.07	0.07	0.07	0.07	0.06	0.05	0.04	0.04	0.04
Futures	g1	Commodities Calendar Spread	Oil, Gas	-0.05	-0.03	0.00	-0.02	0.01	0.03	0.04	0.04	0.04	0.03	0.03
	g2		Gold, Soy, Corn	-0.04	-0.01	0.03	0.05	0.05	0.00	-0.01	-0.02	-0.03	-0.03	-0.03
	g5		Copper	0.07	0.03	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.04	0.05
	g6		Wheat	0.04	0.04	0.05	0.03	0.03	0.04	0.05	0.06	0.06	0.06	0.06
	g7		Alu	-0.08	-0.08	-0.08	-0.06	-0.06	-0.04	-0.04	-0.03	-0.03	-0.02	-0.02
	g3	Stocks Calendar Spread	FTSE,S&P,EUR	-0.03	-0.04	-0.03	-0.02	-0.04	-0.06	-0.07	-0.07	-0.07	-0.08	-0.08
	g4		Hang Seng	-0.08	-0.07	-0.06	-0.06	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08
	g8		TOPIX	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	g9		AEX	-0.05	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
Money	g2	3 Month - 6 Months T-bill Spread	US,TW	0.07	0.08	0.08	0.08	0.06	0.01	-0.04	-0.05	-0.05	-0.06	-0.06
	g5		CA	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07
	g1		BE,FR,IT	-0.03	-0.02	-0.01	-0.02	-0.02	-0.01	0.03	0.04	0.04	0.04	0.04
	g13		ES	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.03	0.04	0.04	0.04	0.04
	g7	TED Spread	US	0.08	0.08	0.07	0.05	0.05	0.08	0.09	0.09	0.09	0.09	0.09
	g3		CA,BE,FR,ES,UK	0.05	0.05	0.05	0.00	-0.03	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03
	g6		IT	-0.05	-0.05	-0.06	-0.06	-0.07	-0.07	-0.06	-0.06	-0.04	-0.04	-0.04
	g12	Overnight - 3 Month Interbank Rate Spread	US	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	g9		CA	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.02	0.02	0.02	0.02
	g4		BE,ES	0.05	0.05	0.04	0.02	-0.02	-0.04	-0.04	-0.05	-0.05	-0.04	-0.04
	g10		IT	-0.02	-0.02	-0.03	-0.03	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
	g8		AU	-0.01	-0.01	-0.02	-0.02	-0.01	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02
	g11		JP	0.02	0.02	0.01	-0.03	-0.04	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03
Stock	g1	Cross Market Ratio	Others **	0.11	0.12	0.12	0.12	0.12	0.10	0.08	0.07	0.07	0.06	0.06
	g2		ID	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.06	0.06	0.06	0.06
	g3		TH	0.00	0.01	0.00	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
	g4		PH	-0.07	-0.07	-0.08	-0.08	-0.09	-0.10	-0.10	-0.10	-0.10	-0.09	-0.10

Notes: Input indicator references, e.g. g1, g2, etc, correspond to the grouping results in Table 3A. * CA, DE, IT, JP, MY, NL, KR, SG, ES, TW, TH, UK, US. ** AU, BR, CA, DE, IN, IT, JP, MY, NL, SG, ES, KR, TW, UK, US. See Table A13 for country shorthand.

Table A10. PRC long-run CIFI lags

				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bank	g1	Total Liability to Equity Ratio & Interest Spread Lending to Deposit Rate	US,CA	3	3	3	2	3	6	6	0	0	0	0
	g4		AU	0	0	0	0	0	0	0	0	0	0	0
	g2		KR,TH	4	5	5	5	4	5	5	5	5	5	5
	g5		KR	5	5	5	0	0	0	0	0	0	0	0
	g8		JP	1	2	2	2	0	0	0	0	0	0	0
	g9		MY	2	2	2	2	2	2	2	2	2	2	2
	g3	M1 - Liquidity Ratio	US,CA	0	0	0	0	0	6	6	6	6	6	6
	g10		UK	6	6	6	6	6	6	6	6	6	6	5
	g11		FR	2	1	2	2	2	0	0	0	0	6	6
	g6		IN	6	6	6	6	6	0	0	0	0	0	0
Bond	g3	Government Bond Spread (10-1 Year, 30-10 Years, 30-1 Year)	US	0	4	4	0	0	0	0	0	0	0	0
	g5		CA	4	4	1	1	0	3	4	4	4	4	4
	g2		UK	6	6	6	6	6	0	0	0	0	0	0
	g1		BE,FR,DE,ES	1	1	1	2	2	2	2	4	4	4	4
	g7		IT	0	0	0	0	6	4	2	2	2	2	2
	g11		ES	5	5	5	5	5	5	5	5	5	5	5
	g6		AU	2	2	2	2	2	2	1	1	1	1	1
	g4		JP	4	4	4	4	4	5	5	5	5	5	5
	g8		MY	6	6	6	6	6	6	6	6	6	6	6
FX	g1	PPP	BR,IN,ID,PH,RU	6	6	6	6	6	6	6	6	6	6	6
	g2		Others *	0	0	0	0	0	0	0	0	0	1	1
Futures	g1	Commodities Calendar Spread	Oil, Gas	2	5	0	2	0	6	6	6	6	6	6
	g2		Gold, Soy, Corn	0	0	5	5	5	0	0	0	0	0	0
	g5		Copper	6	6	6	6	5	5	5	5	5	5	6
	g6		Wheat	0	0	0	0	0	0	0	0	0	0	0
	g7		Alu	1	1	1	1	1	1	1	1	1	1	3
	g3	Stocks Calendar Spread	FTSE,S&P,EUR	2	3	4	2	2	3	3	3	3	3	3
	g4		Hang Seng	0	0	0	0	0	1	1	1	1	1	1
	g8		TOPIX	5	5	5	5	5	5	5	5	5	5	5
	g9		AEX	0	0	0	0	0	0	0	0	0	0	0
Money	g2	3 Month - 6 Months T-bill Spread	US,TW	6	6	6	6	6	6	2	2	2	2	2
	g5		CA	0	0	0	0	3	3	3	3	3	3	3
	g1		BE,FR,IT	0	0	0	0	0	0	6	6	6	6	6
	g13		ES	0	0	0	0	0	0	2	2	6	6	6
	g7	TED Spread	US	0	0	0	0	0	0	0	0	0	0	0
	g3		CA,BE,FR,ES,UK	0	0	0	0	4	5	5	5	5	5	5
	g6		IT	6	6	6	6	6	6	6	6	6	6	6
	g12	Overnight - 3 Month Interbank Rate Spread	US	0	0	0	0	0	0	0	0	0	0	0
	g9		CA	4	4	4	4	3	3	3	3	3	3	3
	g4		BE,ES	1	1	1	1	6	6	6	6	6	6	6
	g10		IT	6	6	6	6	6	6	6	6	6	6	6
	g8		AU	2	2	2	2	0	1	2	2	2	2	2
	g11		JP	5	5	5	2	2	2	2	2	2	2	2
Stock	g1	Cross Market Ratio	Others **	1	1	1	1	6	6	6	6	6	6	6
	g2		ID	0	0	0	0	0	0	0	0	0	0	0
	g3		TH	0	0	0	6	6	6	6	6	6	6	6
	g4		PH	5	5	5	5	5	5	5	5	5	5	5

Notes: Input indicator references, e.g. g1, g2, etc, correspond to the grouping results in Table 3A. * CA, DE, IT, JP, MY, NL, KR, SG, ES, TW, TH, UK, US. ** AU, BR, CA, DE, IN, IT, JP, MY, NL, SG, ES, KR, TW, UK, US. See Table A13 for country shorthand.

Table A11. TPC long-run CIFI weights

				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bank	g1	Total Liability to Equity Ratio & Interest Spread Lending to Deposit Rate	US,CA	-0.09	-0.09	-0.07	-0.05	-0.03	-0.05	-0.06	-0.07	-0.08	-0.09	-0.09
	g4		AU	0.04	0.05	0.07	0.08	0.09	0.08	0.07	0.06	0.06	0.05	0.04
	g2		KR,TH	-0.09	-0.10	-0.10	-0.10	-0.08	-0.05	-0.04	-0.02	-0.02	-0.01	0.00
	g5		KR	0.09	0.10	0.12	0.12	0.12	0.12	0.11	0.10	0.09	0.08	0.08
	g8		JP	0.07	0.05	0.02	0.00	-0.02	-0.03	-0.05	-0.05	-0.06	-0.07	-0.07
	g9		MY	-0.03	-0.04	-0.04	-0.04	-0.05	-0.06	-0.07	-0.08	-0.08	-0.09	-0.09
	g3	M1 - Liquidity Ratio	US,CA	0.10	0.10	0.10	0.08	0.05	0.03	0.03	0.02	0.03	0.03	0.03
	g10		UK	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10	-0.09	-0.08	-0.06	0.00	0.03
	g11		FR	-0.03	-0.03	-0.04	-0.06	-0.08	-0.08	-0.08	-0.08	-0.07	-0.06	-0.03
	g6		IN	0.09	0.10	0.11	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11
Bond	g3	Government Bond Spread (10-1 Year, 30-10 Years, 30-1 Year)	US	-0.04	-0.05	-0.06	-0.06	-0.04	0.00	0.03	0.04	0.05	0.05	0.06
	g5		CA	0.00	-0.01	-0.03	-0.04	-0.02	0.01	0.02	0.02	0.01	0.01	0.01
	g2		UK	0.05	0.06	0.05	0.04	0.05	0.07	0.08	0.08	0.09	0.09	0.09
	g1		BE,FR,DE,ES	0.02	0.01	-0.02	-0.03	-0.04	0.00	0.01	0.02	0.03	0.04	0.04
	g7		IT	0.06	0.06	0.04	0.03	0.03	0.05	0.06	0.07	0.07	0.07	0.06
	g11		ES	-0.08	-0.08	-0.08	-0.08	-0.07	-0.04	-0.02	-0.01	0.00	0.01	0.02
	g6		AU	0.06	0.05	0.03	-0.02	-0.01	0.01	0.01	0.01	0.00	0.02	0.02
	g4		JP	0.07	0.07	0.06	0.04	0.02	0.01	0.00	-0.01	-0.02	-0.03	-0.05
	g8		MY	-0.03	-0.03	-0.05	-0.05	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
FX	g1	PPP	Others*	-0.07	-0.06	-0.04	-0.02	0.01	0.03	0.05	0.06	0.07	0.08	0.08
	g2		JP	0.08	0.07	0.05	0.03	-0.01	-0.03	-0.04	-0.06	-0.07	-0.07	-0.08
	g3		SG	0.08	0.08	0.07	0.07	0.08	0.09	0.10	0.10	0.10	0.10	0.11
Futures	g1	Commodities Calendar Spread	Oil, Gas	0.02	0.03	0.05	0.04	0.05	0.06	0.06	0.05	0.05	0.04	0.03
	g2		Gold, Soy, Corn	0.02	0.03	0.05	0.06	0.06	0.04	0.03	0.02	-0.02	-0.03	-0.03
	g5		Copper	-0.07	-0.07	-0.07	-0.06	-0.05	-0.03	-0.02	0.00	0.01	0.01	0.01
	g6		Wheat	-0.05	-0.05	-0.04	-0.05	-0.03	0.00	0.02	0.03	0.03	0.03	0.03
	g7		Alu	0.03	0.03	0.02	0.03	0.04	0.05	0.04	0.04	0.05	0.05	0.05
	g3	Stocks Calendar Spread	FTSE,S&P,EUR	-0.04	-0.04	-0.04	-0.02	-0.03	-0.05	-0.06	-0.06	-0.07	-0.08	-0.08
	g4		Hang Seng	0.03	0.03	0.03	0.03	0.01	-0.02	-0.02	-0.03	-0.04	-0.04	-0.04
	g8		TOPIX	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.00
	g9		AEX	0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03
Money	g2	3 Month - 6 Months T-bill Spread	US	0.05	0.06	0.07	-0.03	-0.06	-0.08	-0.09	-0.09	-0.09	-0.10	-0.10
	g5		CA	0.06	0.07	0.06	0.06	0.05	0.04	0.03	0.02	0.01	0.00	-0.01
	g1		BE,FR,IT	0.02	0.03	0.04	0.04	0.03	0.03	0.05	0.05	0.05	0.04	0.03
	g13		ES	0.04	0.05	0.05	0.05	0.05	0.05	0.06	0.07	0.07	0.06	0.05
	g7	TED Spread	US	-0.03	-0.03	-0.03	0.02	0.05	0.07	0.09	0.09	0.09	0.10	0.10
	g3		CA,BE,FR,ES,UK	-0.02	-0.01	-0.01	-0.04	-0.06	-0.06	-0.05	-0.05	-0.04	-0.03	-0.03
	g6		IT	0.05	0.05	0.04	0.03	0.00	-0.01	-0.01	0.01	0.03	0.03	0.04
	g12	Overnight - 3 Month Interbank Rate Spread	US	-0.07	-0.08	-0.09	-0.08	-0.09	-0.07	-0.06	-0.05	-0.04	-0.03	-0.02
	g9		CA	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04
	g4		BE,ES	-0.04	-0.05	-0.06	-0.07	-0.08	-0.08	-0.08	-0.08	-0.06	-0.05	-0.04
	g10		IT	-0.04	-0.05	-0.06	-0.07	-0.08	-0.09	-0.08	-0.07	-0.06	-0.05	-0.04
	g8		AU	-0.04	-0.05	-0.05	-0.06	-0.05	-0.05	-0.05	-0.04	-0.02	-0.02	-0.02
	g11		JP	0.04	0.00	-0.01	-0.03	-0.05	-0.05	-0.04	-0.03	-0.02	-0.02	-0.01
Stock	g1	Cross Market Ratio	AU,BR,CA,IN,SG,KR	-0.03	0.00	0.03	0.05	0.07	0.08	0.09	0.09	0.09	0.09	0.09
	g2		BE,FR,DE,IT,NL,ES,UK	-0.08	-0.07	-0.05	-0.03	-0.02	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
	g3		CH,ID,MY,PH,TH	0.09	0.10	0.10	0.11	0.10	0.10	0.09	0.09	0.09	0.09	0.09
	g4		JP	0.05	0.05	0.06	0.07	0.06	0.05	0.03	0.00	-0.01	-0.01	-0.02
	g5		US	-0.10	-0.10	-0.09	-0.09	-0.07	-0.06	-0.05	-0.04	-0.02	-0.01	0.01

Notes: Input indicator references, e.g. g1, g2, etc, correspond to the grouping results in Table 3A. * BE, BR, CA, FR, DE, IN, ID, IT, MY, NL, PH, RU, KR, ES, TH, UK, US, CH. See Table A13 for country shorthand.

Table A12. TPC long-run CIFI lags

					2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Bank	g1	Total Liability to Equity Ratio & Interest Spread Lending to Deposite Rate		US,CA	6	6	6	6	6	3	1	1	1	1	1
	g4			AU	6	6	6	6	6	6	6	6	6	6	6
	g2			KR,TH	0	0	0	0	2	0	0	0	0	0	0
	g5			KR	5	5	5	5	5	5	5	5	5	5	5
	g8			JP	5	6	6	0	0	0	0	0	0	0	0
	g9			MY	0	0	0	0	0	0	0	0	0	0	0
	g3	M1 - Liquidity Ratio		US,CA	6	6	6	6	6	2	0	0	0	0	0
	g10			UK	0	0	0	0	0	0	0	0	4	0	0
	g11			FR	3	3	3	3	3	3	3	3	3	5	5
	g6			IN	3	3	3	3	3	3	3	3	4	3	4
Bond	g3	Government Bond Spread (10-1 Year, 30-10 Years, 30-1 Year)		US	0	0	0	0	0	0	6	6	6	6	6
	g5			CA	0	0	0	0	1	5	6	6	6	6	6
	g2			UK	6	6	6	6	6	6	6	6	6	6	6
	g1			BE,FR,DE,ES	3	4	0	0	6	0	0	0	0	2	6
	g7			IT	6	6	6	6	0	0	0	0	0	6	6
	g11			ES	0	0	0	0	0	0	0	0	0	4	4
	g6			AU	6	6	6	0	6	3	6	6	3	0	0
	g4			JP	4	4	5	4	0	0	6	6	1	0	0
	g8			MY	0	0	0	0	5	0	0	0	0	0	0
FX	g1	PPP		Others*	0	0	2	2	6	6	6	6	6	6	6
	g2			JP	6	6	6	6	0	0	0	0	0	0	0
	g3			SG	6	6	6	6	1	0	0	0	0	0	0
Futures	g1	Commodities Calendar Spread		Oil,Gas	6	0	6	6	0	1	6	6	6	6	1
	g2			Gold,Soy,Corn	1	1	1	1	4	3	5	5	0	0	6
	g5			Copper	1	1	1	1	1	2	2	1	0	6	6
	g6			Wheat	3	3	3	4	4	0	0	0	6	6	6
	g7			Alu	4	0	0	0	0	0	4	0	0	0	5
	g3	Stocks Calendar Spread		FTSE,S&P,EUR	6	6	6	6	2	2	4	2	2	2	2
	g4			Hang Seng	1	1	1	2	2	5	5	5	5	0	5
	g8			TOPIX	6	6	6	6	6	6	6	6	6	1	1
	g9			AEX	2	6	6	6	6	6	6	6	6	6	6
Money	g2	3 Month - 6 Months T-bill Spread		US	6	6	6	0	0	0	0	0	0	0	0
	g5			CA	2	2	2	2	4	2	2	4	4	0	0
	g1			BE,FR,IT	0	0	0	0	0	0	0	0	0	0	1
	g13			ES	1	1	0	0	0	1	1	1	1	1	1
	g7	TED Spread		US	2	2	2	0	0	0	0	0	6	6	6
	g3			CA,BE,FR,ES,UK	6	6	6	1	3	3	3	3	6	6	3
	g6			IT	0	0	0	3	0	2	2	0	0	0	0
	g12	Overnight - 3 Month Interbank Rate Spread		US	3	3	3	6	2	3	3	3	3	3	3
	g9			CA	1	1	1	1	1	1	1	1	1	1	1
	g4			BE,ES	1	1	1	1	1	1	1	1	1	1	1
	g10			IT	3	3	3	3	3	3	3	3	3	3	3
	g8			AU	1	1	2	1	6	2	2	4	5	2	4
	g11			JP	5	0	0	0	0	0	0	0	0	0	0
Stock	g1	Cross Market Ratio		AU,BR,CA,IN,SG,KR	0	0	6	6	6	6	6	6	6	6	6
	g2			BE,FR,DE,IT,NL,ES,UK	4	2	4	2	2	0	0	0	0	0	0
	g3			CH,ID,MY,PH,TH	6	6	4	4	4	4	0	0	0	0	0
	g4			JP	6	6	6	6	6	6	6	1	1	0	0
	g5			US	1	1	0	0	0	0	0	1	1	5	0

Notes: Input indicator references, e.g. g1, g2, etc, correspond to the grouping results in Table 3A. * BE, BR, CA, FR, DE, IN, ID, IT, MY, NL, PH, RU, KR, ES, TH, UK, US, CH. See Table A13 for country shorthand.

Table A13. Country shorthand

COUNTRIES	SHORTHAND
Australia	AU
Belgium	BE
Brazil	BR
Canada	CA
PRC	CH
France	FR
Germany	DE
India	IN
Indonesia	ID
Italy	IT
Japan	JP
Malaysia	MY
Netherlands	NL
Philippines	PH
Russia	RU
Saudi Arabia	SA
Singapore	SG
South Korea	KR
Spain	ES
TPC	TW
Thailand	TH
UK	UK
US	US