
10. Capital Account Liberalisation in China¹

Reform sequence, risks and selective policy issues

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Introduction

Recent decades have witnessed a global wave of financial liberalisation unprecedented in both intensity and scope. This follows the breakdown of the Bretton Woods fixed exchange rate system in the early 1970s. The wave first appeared in high-income economies, following which, during the 1990s, a large number of emerging economies undertook profound financial reforms. Most but not all high-income economies introduced gradual reforms implementation characterised by domestic financial reforms and then capital account opening. In contrast, the process of reforms for developing economies lacked a clear sequence (see Figure 10.1).

As the 1990s unfolded, some developing economies undertook rapid, aggressive reforms at about the same time, and some relaxed capital controls during the very early stages of the reform process. On the one hand, the aggressive approach suggests an element of reform efficiency. On the other hand, this approach is typically accompanied by short-term pain that results from the relatively high risk of financial turbulence. In the second half of the 1990s and early 2000s, most of the countries that adopted the aggressive approach to financial reform experienced deep and traumatic financial crises, such as Mexico's 'Tequila' crisis and the East Asian Financial Crisis (World Bank 2001). In contrast, countries that adopted a gradual approach seldom faced such crises, but paid efficiency costs for delaying the reform process.

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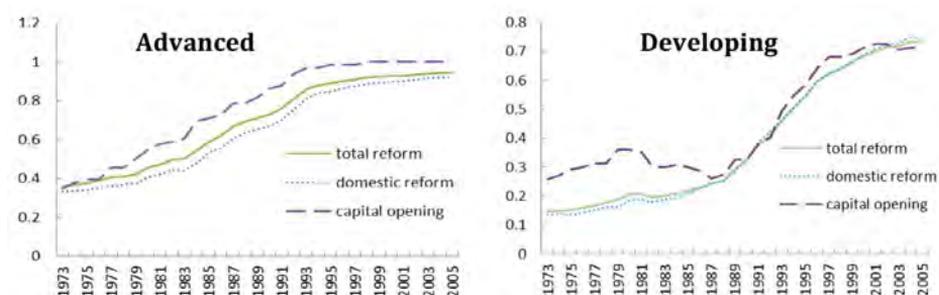


Figure 10.1 Trends in global financial reform

Notes: Total reform is defined as reform of the domestic financial system concurrent with opening of the capital account, and refers to the financial reform index constructed by Abiad et al. (2008). Domestic reform is defined as those reforms applying to the intra-country financial system, including interest rate controls, credit controls, prudential regulations, supervision of the banking sector and equity market policy. Capital reforms specifically measure the liberalisation of the capital account. Along each reform dimension, Abiad et al. (2008) allocate a country a score from zero to three, increasing the scale as liberalisation increases. Inverse scoring is used in constructing the index of banking system regulation and supervision.

Sources: Abiad et al. (2008); and authors' calculations.

In parallel with the varying stylised facts associated with different financial reform sequencing strategies among countries runs a longstanding heated debate on this topic in the academic literature. Some economists argue that correct sequencing, staggered over time, is important to avoid financial instability and minimise the risk of crisis that has been attached to free capital mobility (Edwards 1984, 1990; Funke 1993; McKinnon 1973, 1991; Stiglitz 2002). On the other hand, economists have also argued for simultaneous reform so as to improve economic and reform efficiency, including via interest rate liberalisation and exchange rate flexibility (Choksi and Papageorgiou 1986; Quirk and Evans 1995).

Within this broader debate, China, like many other developing economies, confronts a complex set of questions related to the desirability and mode of implementing capital account liberalisation as well as to domestic financial reform. In the past 15 years, incremental progress has been made in liberalisation of the capital account. Recent liberalisation measures include the launch of the Shanghai–Hong Kong Stock Connect program, amendment of foreign investment law and an increase in the scale of Qualified Foreign Institutional Investor (QFII), Renminbi Qualified Foreign Institutional Investor (RQFII) and Qualified Domestic Institutional Investor (QDII) schemes.

Following such progress in China's financial reform program, the 2014 *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAR)* (IMF 2014) considered that of China's 40 capital account transaction items, 14 (some 35 per cent) have essentially been liberalised, 23 (57.5 per cent) have

been partially liberalised and three (7.5 per cent) remain restricted. The last three items relate mainly to controls on capital and money market instruments, and controls on derivatives and other instruments.

Inward foreign direct investment (FDI) was among the earliest items to be liberalised in China—a process that began in the mid-1980s and accelerated in the early 1990s. The stock of inward FDI stood at US\$1.8 trillion in 2014—equivalent to almost 20 per cent of China’s gross domestic product (GDP). Outward FDI and portfolio flows, in comparison, remain restricted. Stocks of outward FDI, as well as inward and outward portfolio investments, amounted to about 7 per cent of GDP or less in 2014. While there has been some progress in capital account liberalisation in recent decades, the degree of capital account convertibility in China remains low compared with high-income economies and also some developing economies.

At the Third Plenary Session of the Eighteenth Central Committee of the Chinese Communist Party in late 2013, a comprehensive market-oriented reform program was authorised.² Financial reform is a significant component of these planned reforms. It comprises some 11 items of the newly authorised reform agenda, including the opening up of both foreign and private financial institutions; establishing a system of market-based interest rates, exchange rates and of the official yield curve; developing multilayered capital markets; capital account convertibility; and improved financial regulation (Central Committee of the Chinese Communist Party 2013).

While most of these items individually are in urgent need of reform, unavoidably, related reforms can only be pushed through simultaneously or in sequence. A heated debate has ensued as to the right approach to take in implementing China’s financial reforms. Some economists believe a precondition for capital account convertibility should be reforms that deliver a strong domestic banking system, relatively developed domestic financial markets, interest rate liberalisation and exchange rate flexibility (Lardy and Douglass 2011; Prasad et al. 2005; Yu 2013). Other economists and policymakers argue for the acceleration of capital account convertibility in order to reap its growth benefit, removing capital control costs or even pushing back domestic financial reforms.

This chapter reviews the issues involved in moving towards deeper domestic financial liberalisation and capital account liberalisation in China. Despite the extensive literature on financial reform sequencing, empirical evidence on the crisis risks of alternative sequencing strategies is relatively limited. In this

2 The decision involved several aspects including society, politics, economy, culture and ecological civilisation. Decisions of the Central Committee of the Communist Party of China at the Third Plenum of the Eighteenth Party Congress are available from: www.china.org.cn/. Retrieved 16 January 2014.

chapter, we use experience of financial reforms to investigate the crisis risks of alternative financial reform sequencing, using a cross-country panel-data analysis for 50 economies in the years 1973–2005.

The second section of the chapter reviews the related literature. In the third section, we lay out the empirical model used to analyse financial crisis risks around alternative sequencing of financial reforms. In the fourth section, we apply these empirical results to a scenario-based study of the implications for China's onward financial reform, before offering some concluding remarks.

A brief literature review of capital account liberalisation

The theoretical literature suggests that there are several benefits of capital account liberalisation. First, liberalisation improves capital allocation efficiency and risk diversification, and fosters financial development, which in turn stimulate economic growth (Kose et al. 2009). Second, it avoids the transaction cost of capital controls, which in any case are not perfectly effective.

There are also several arguments in favour of capital controls. First, extreme flows of capital are likely to induce excessive fluctuations in liquidity and to render monetary policies ineffective. Second, large capital flows help to synchronise the domestic and international business cycles, implying the domestic economy risks unpredictable capital flow reversals and severe financial instability, even financial distress and crises (Bhagwati 1998; Levy Yeyati et al. 2009; Rodrik 1998; Stiglitz 2002).

Empirical studies, however, find little conclusive evidence for growth-enhancing effects (Edison et al. 2002; Quinn and Toyoda 2008; Rodrik 1998). Nor has consensus been reached on the net effects of the volatility and crisis risks induced by free capital flows across countries (Edwards 2007, 2008; Glick and Hutchison 2001; Glick et al. 2006; Hutchison and Noy 2005).

A more nuanced literature exploring the effects of financial reform according to their sequence offers some insight into how countries can reap the benefits and minimise the costs of capital account liberalisation (IMF 2012). Sequencing here is defined as the setting of a clear order among financial sector liberalisation measures (IMF 2012). There are three different views on the importance of sequencing.

The first view favours gradual reform that incrementally implements reforms in an appropriate sequence. This is usually called the 'gradualist approach'. Three main reasons why the appropriate sequencing and coordination of reforms are important are summarised by the IMF (2012: 317):

Inappropriate sequencing of reforms could cause excessive risk taking and financial instability; limited institutional capacity necessarily requires some prioritization of reform elements; given the numerous policy and operational reforms in each area of financial policy, setting priorities could facilitate and encourage the adoption of reforms; hence, this aspect of financial sector assessments is important.

Before this note from the IMF, sequencing of financial reforms had been of less concern since the early stages of the post-fixed exchange rate financial and capital account liberalisation process (Edwards 1984, 1990; Funke 1993; McKinnon 1973, 1991; Prasad et al. 2005; Stiglitz 2002). In general, these authors argue that eliminating capital restrictions too early can be costly because of the effects on the (real) exchange rate and on international competitiveness, and also the potential short-term effect of instigating an asset-price boom. More dangerously again, the country may be subject to 'sudden stops' of capital inflow, and also to large-scale capital flight when capital inflows are unexpectedly withdrawn by foreign investors (speculators). In such circumstances, the country is forced to devalue its currency and can suffer a costly monetary crisis. Such a crisis can also spread to other countries and result in a severe international or regional crisis.

The East Asian currency crisis provides an example that is suggestive of a pattern of inappropriate sequencing of capital account liberalisation that contributed to both the speed and the severity of the crisis in many countries (Edwards 2009; World Bank 2001). Development of adequate institutional capacity appears to be an important and necessary precondition for coping with capital account liberalisation volatility, and thus for reaping net gains from that process (IMF 2012; Obstfeld and Taylor 2004). This thus raises the issue of the institutional design and scope of reform strategies for safeguarding macroeconomic and financial stability (IMF 2003, 2012).

This further raises the question of what is the appropriate sequence. McKinnon (1993) offers a widely influential argument that reform of the domestic financial sector and trade liberalisation should precede liberalisation of the capital account. The reason is that in a distorted domestic financial system with interest rate regulations and credit controls that lack sufficient supervision, opening of the capital account will either lead to capital flight that in turn erodes the domestic deposit base or lead to over-borrowing foreign currency, which is also risky.

In contrast, the ‘interest group theory’, proposed by Rajan and Zingales (2003), suggests that trade and capital account openness should instead precede domestic financial liberalisation (Hauner and Prati 2008). Their logic relates to the fact that in a closed economy, interest groups oppose financial development because they benefit from preventing the entrance of new competitors. In this way, early trade and capital liberalisation introduce new external competition that challenges the rents enjoyed by local interest groups in the closed economy, and thus facilitates financial development.

Another body of thought argues for simultaneous reforms—that is, for no sequencing at all. There are three points of logic behind these arguments. The first is that full liberalisation of the capital account can promote flexibility in both the exchange rate and the interest rate, which could in turn support capital account reforms (Quirk and Evans 1995). Second, simultaneous reform has no reform cost but brings great economic benefit in the absence of market distortions and externalities (Choksi and Papageorgiou 1986). Finally, a ‘big-bang’ reform can avoid the delays brought by interest groups and thus reduce the costs of reform.

Capital account liberalisation, sequence and crisis: An empirical investigation

We investigate the effects of financial reform sequencing on the likelihood of experiencing financial crisis. Following Edwards (2009), Ghosh et al. (2014) and others, we specify the following benchmark variance component panel probit model (Equations 10.1 and 10.2).

Equation 10.1

$$Crisis_{it} = \begin{cases} 1, & \text{if } Crisis_{it}^* > 0 \\ 0, & \text{otherwise} \end{cases}$$

Equation 10.2

$$Crisis_{it}^* = \beta_0 + \beta_1 Kaopen_{it} + \beta_2 Kaopen_{it} * Fin_domestic_{it} + X_{it} + \varepsilon_{it}$$

In Equations 10.1 and 10.2, $Crisis_{it}$ is a dummy variable that takes the value of one if country i in period t experiences a financial crisis (banking, currency or debt crisis), and zero otherwise. Whether a country experiences a crisis is the result of an unobserved latent variable, $Crisis_{it}^*$, which is a function of the degree of capital opening ($Kaopen_{it}$) and domestic financial system liberalisation, and a group of other controlled variables within the vector X_{it} , including GDP per capita (in log term), the annual growth rate of GDP per capita, the inflation

rate based on the consumer price index (CPI), the growth rate of the ratio of broad money to foreign reserves, the real interest rate, the real exchange rate overvaluation, the current account surplus over GDP, financial development measured as the ratio of private credit to GDP, and government deficit over GDP.

Crisis data are sourced from Laeven and Valencia (2013), whose dataset comprises all systemic banking, currency and sovereign debt crises during the period 1970–2011. They define a systemic banking crisis as either significant signs of financial distress in the banking system or severe banking policy intervention, while currency crisis is defined as a nominal depreciation of the currency via the US dollar of at least 30 per cent that is also at least 10 percentage points higher than the rate of depreciation in the year before; a sovereign debt crisis is defined as sovereign debt default and restructuring. $Crisis_{it}$ takes a value of one if at least one of these events happens, and zero otherwise. All controlled variables are lagged one year in order to control for potential endogeneity issues arising from a reverse causal effect from crisis to the control variables, and thus omitting the variable effects.

The capital account liberalisation indicator used, $Kaopen_{it}$, is constructed by Quinn and Toyoda (2008), and is a standard indicator used in the literature. This measures de jure restrictions on cross-border financial transactions based on detailed information on restrictions on capital transactions collected by *AREAER* (IMF 2014). The data are constructed around an index range of 0–100, where a higher value implies a higher degree of capital account liberalisation. We construct our own index of capital account liberalisation by dividing the Quinn and Toyoda (2008) indicator by 100 to obtain an index scaled from zero to one.

The domestic financial reform indicator, $Fin_domestic_{it}$, is constructed by aggregating domestic financial system reform indicators from the financial reform dataset of Abiad et al. (2008). That dataset captures the degree of liberalisation in five dimensions: 1) credit controls and reserve requirements; 2) interest rate controls; 3) entry barriers to the banking industry; 4) state ownership of banks; and 5) regulations and supervision of the banking sector. Along each dimension, a country was given a score between zero and three, with zero corresponding to repression and three indicating full liberalisation. For banking system regulation and supervision, the opposite scoring is true. These scores were normalised to a range from zero to one. This index is available for a sample of 91 countries in the period 1973–2005.

Since domestic financial reform is a multifaceted phenomenon, we further divide domestic financial reforms by three sub-dimensions: banking system reform, which includes entry barriers to the banking industry; state ownership of banks and regulation and supervision of the banking sector (Fin_bank_{it}); interest rate

control ($Fin_interest_{it}$) and credit controls (Fin_credit_{it}). Definitions of all the variables and their sources are summarised in Table A10.1 in the Appendix, while descriptive statistics are reported in Table A10.2.

Baseline empirical results

To examine the impact of domestic financial reform and capital account liberalisation on the probability of financial crisis, we start with a baseline model covering the entire sample. We run panel data regressions using a random effects probit model, the results of which are reported in Table 10.1.

The significantly positive coefficient of *Kaopen* and the significantly negative coefficient of its cross-term with domestic financial reform in column (1) indicate that capital opening (*Kaopen*) increases the likelihood of experiencing a crisis, while domestic financial system reform facilitates in reducing the crisis-inducing effect of capital account opening.

For the three types of financial crisis, the results are mostly consistent: the coefficient of *Kaopen* is positive and significant, except in the case of currency crisis; and the coefficient on the cross-term with domestic financial reform is significant and negative. Moreover, the coefficients are very stable, varying from 1.32 to 1.61 for *Kaopen* and -1.68 to -1.89 for the cross-term. This means a 1 per cent increase in capital opening is associated with an increase in the propensity of experiencing a crisis by 1.4 per cent, while a 1 per cent increase in domestic financial reform is associated with a 1.7 per cent increase in crisis propensity. Therefore, a more open domestic financial system helps buffer an economy from financial risks caused by capital account opening. The influence of other variables is as predicted.

Table 10.1 Marginal effects and predicted probabilities of financial crisis: The role of capital account opening and domestic financial reform

	(1)	(2)	(3)	(4)
Variables	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
Kaopen	1.6143** (0.6269)	1.4802** (0.7137)	1.3246 (0.8767)	1.4275** (0.7085)
Kaopen*Fin_domestic	-1.8841*** (0.5745)	-1.8197*** (0.6457)	-1.6881** (0.8288)	-1.7650*** (0.6420)
Fixed EXR	-0.6132 (0.4152)	-0.0733 (0.4549)	-1.1383* (0.6711)	-0.0786 (0.4508)
Intermediate EXR	-0.0042 (0.2974)	0.0276 (0.3497)	0.0323 (0.4559)	0.0111 (0.3475)
GGDP	-2.6722 (2.1325)	1.6215 (2.6016)	-6.2185** (2.7526)	1.5592 (2.6023)
Log(GDP)	-0.2202 (0.0823)	-0.1259 (0.0984)	-0.2200* (0.1131)	-0.1214 (0.0981)
Inflation	0.1674 (0.1738)	0.2051 (0.2198)	0.1561 (0.2176)	0.1926 (0.2206)
M2_reserve	0.3974** (0.1734)	0.1170 (0.2336)	0.7054*** (0.2206)	0.1040 (0.2196)
Real interest	0.4298 (0.8549)	1.9737** (0.9891)	-0.6393 (1.2086)	1.8595* (0.9821)
Real exchange rate overvaluation	0.0114** (0.0046)	0.0072 (0.0064)	0.0151*** (0.0054)	0.0067 (0.0065)
Current account surplus (% of GDP)	-2.4192 (1.8413)	-2.4621 (2.0962)	-2.4595 (2.7738)	-2.2879 (2.0847)
Financial development	0.0047* (0.0028)	0.0048 (0.0033)	0.0029 (0.0043)	0.0044 (0.0032)
Predicted probabilities	5.20%	3.41%	2.56%	3.25%
Observations	890	890	890	890
No. of countries	50	50	50	50
R-squared	0.148	0.102	0.266	0.096

*** p<0.01

** p<0.05

* p<0.1

Note: Standard errors are in parentheses.

Source: Authors' estimations.

To analyse the influence of the specific domestic financial reforms on the consequences of capital account opening, we separately examine the three areas of domestic financial reform—namely, domestic banking sector reform, interest

rate liberalisation and credit reform (Tables 10.2–10.4). We find similar results in Table 10.2, as domestic banking sector reforms are associated with reduced capital account opening crisis risks, for each type of financial crisis. Specifically, a 1 per cent increase in capital opening is associated with an increase in the propensity of experiencing a crisis by about 1 per cent, while a 1 per cent increase in domestic financial reform is associated with a decrease in crisis risk of some 1.4 per cent. The effects of other controlling variables still hold.

The results suggest that banking system reform—which mainly refers to reducing entry barriers to the banking sector, allowing greater development of private banks—and strengthening regulation and supervision of the banking sector play an important role in mitigating the financial risks of capital account opening. This is possibly because greater supervision and competition increase the risk-management capacities of the domestic banking sector and thus increase domestic market resilience in the face of external economic and financial shocks that could trigger capital outflows on the level of a financial crisis.

Table 10.2 Marginal effects and predicted probabilities of financial crisis: The role of capital account opening and banking sector reform

	(1)	(2)	(3)	(4)
Variables	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
Kaopen	1.1356**	1.0073*	0.8902	0.9702*
	(0.5119)	(0.5815)	(0.7166)	(0.5779)
Kaopen_bank	-1.5203***	-1.4754***	-1.3338**	-1.4341***
	(0.4640)	(0.5242)	(0.6711)	(0.5215)
Fixed EXR	-0.5585	-0.0232	-1.0806	-0.0278
	(0.4096)	(0.4514)	(0.6577)	(0.4474)
Intermediate EXR	-0.0241	0.0089	0.0121	-0.0058
	(0.2950)	(0.3478)	(0.4481)	(0.3459)
GGDP	-2.8479	1.4437	-6.4181**	1.4010
	(2.1270)	(2.6105)	(2.7475)	(2.6082)
Log(GDP)	-0.2193***	-0.1250	-0.2157*	-0.1209
	(0.0828)	(0.0992)	(0.1135)	(0.0990)
Inflation	0.1390	0.1742	0.1322	0.1629
	(0.1779)	(0.2286)	(0.2204)	(0.2290)
M2_reserve	0.3933**	0.1090	0.7011***	0.0954
	(0.1731)	(0.2341)	(0.2197)	(0.2200)
Real interest	0.2173	1.7482*	-0.8488	1.6421*
	(0.8578)	(0.9877)	(1.2170)	(0.9806)
Real exchange rate overvaluation	0.0113**	0.0074	0.0150***	0.0069
	(0.0046)	(0.0063)	(0.0055)	(0.0063)

	(1)	(2)	(3)	(4)
Variables	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
Current account surplus (% of GDP)	-2.4341 (1.8323)	-2.4079 (2.0850)	-2.6362 (2.7740)	-2.2437 (2.0744)
Financial development	0.0043 (0.0028)	0.0044 (0.0032)	0.0025 (0.0042)	0.0040 (0.0032)
Predicted probabilities	5.19%	3.40%	2.57%	3.25%
Observations	817	795	803	813
No. of countries	50	50	50	50
R-squared	0.148	0.103	0.265	0.097

*** p<0.01

** p<0.05

* p<0.1

Note: Standard errors are in parentheses.

Source: Authors' estimations.

For the other two dimensions of domestic financial reform, we find that while credit reform is associated with decreasing the crisis risks of capital account opening (Table 10.3), interest rate liberalisation unexpectedly has a positive but insignificant effect (Table 10.4). Eliminating credit controls meanwhile facilitates capital allocation efficiency and removes distortions in the domestic financial system—a result supported by (McKinnon 1991).

Table 10.3 Marginal effects and predicted probabilities of financial crisis: The role of capital account opening and credit distribution

	(1)	(2)	(3)	(4)
Variables	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
Kaopen	0.5847 (0.4722)	0.4140 (0.5526)	0.5201 (0.6279)	0.3961 (0.5529)
Kaopen_credit	-0.7845** (0.3696)	-0.6642 (0.4285)	-0.8760* (0.5138)	-0.6363 (0.4274)
Fixed EXR	-0.4757 (0.3934)	-0.0067 (0.4309)	-0.9618 (0.6401)	-0.0107 (0.4273)
Intermediate EXR	-0.0335 (0.2919)	-0.0119 (0.3407)	-0.0022 (0.4498)	-0.0245 (0.3392)
GGDP	-2.8711 (2.1179)	1.3334 (2.5673)	-6.3950** (2.7565)	1.2590 (2.5684)
Log(GDP)	-0.1827** (0.0799)	-0.0946 (0.0956)	-0.1820* (0.1091)	-0.0927 (0.0954)
Inflation	0.2078 (0.1649)	0.2504 (0.1994)	0.1803 (0.2116)	0.2358 (0.1998)

	(1)	(2)	(3)	(4)
Variables	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
M2_reserve	0.4102**	0.1480	0.7017***	0.1266
	(0.1714)	(0.2281)	(0.2165)	(0.2138)
Real interest	0.7513	2.2359**	-0.3327	2.1078**
	(0.8536)	(0.9949)	(1.2073)	(0.9873)
Real exchange rate overvaluation	0.0111**	0.0067	0.0147***	0.0063
	(0.0046)	(0.0065)	(0.0054)	(0.0065)
Current account surplus (% of GDP)	-2.5391	-2.6568	-2.4772	-2.4821
	(1.7814)	(2.0272)	(2.7011)	(2.0148)
Financial development	0.0034	0.0034	0.0021	0.0030
	(0.0027)	(0.0032)	(0.0042)	(0.0031)
Predicted probabilities	5.21%	3.41%	2.57%	3.26%
Observations	817	795	803	813
No. of countries	50	50	50	50
R-squared	0.128	0.077	0.259	0.072

*** p<0.01

** p<0.05

* p<0.1

Note: Standard errors are in parentheses.

Source: Authors' estimations.

Table 10.4 Marginal effects and predicted probabilities of financial crisis: The role of capital account opening and interest rate liberalisation

	(1)	(2)	(3)	(4)
Variables	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
Kaopen	0.0617	0.2639	-0.3028	0.2702
	(0.7140)	(0.7766)	(1.0331)	(0.7752)
Kaopen_int	-0.1202	-0.3835	0.1529	-0.3847
	(0.5540)	(0.5875)	(0.8283)	(0.5864)
Fixed EXR	-0.4989	-0.0953	-0.8611	-0.0942
	(0.3947)	(0.4321)	(0.6324)	(0.4298)
Intermediate EXR	-0.0087	0.0090	0.0420	0.0003
	(0.2856)	(0.3334)	(0.4349)	(0.3325)
GGDP	-2.9846	1.2262	-6.5579**	1.1574
	(2.0975)	(2.5474)	(2.7354)	(2.5490)
Log(GDP)	-0.1959**	-0.1116	-0.1886*	-0.1095
	(0.0802)	(0.0959)	(0.1098)	(0.0957)
Inflation	0.1972	0.2401	0.1615	0.2271
	(0.1614)	(0.1928)	(0.2043)	(0.1930)

	(1)	(2)	(3)	(4)
Variables	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
M2_reserve	0.4096** (0.1697)	0.1553 (0.2247)	0.6873*** (0.2123)	0.1331 (0.2111)
Real interest	0.5988 (0.8407)	2.0538** (0.9776)	-0.5212 (1.1824)	1.9387** (0.9698)
Real exchange rate overvaluation	0.0105** (0.0046)	0.0060 (0.0063)	0.0141*** (0.0054)	0.0056 (0.0063)
Current account surplus (% of GDP)	-2.6725 (1.7495)	-2.6763 (2.0008)	-2.8106 (2.6414)	-2.5335 (1.9927)
Financial development	0.0025 (0.0027)	0.0028 (0.0031)	0.0004 (0.0041)	0.0025 (0.0031)
Predicted probabilities	5.19%	3.39%	2.56%	3.25%
Observations	817	795	803	813
No. of countries	50	50	50	50
R-squared	0.114	0.069	0.243	0.065

*** p<0.01

** p<0.05

* p<0.1

Note: Standard errors are in parentheses.

Source: Authors' estimations.

Evaluation of the early warning system

We test the predictive power of our empirical model following the methods of the early warning system literature (Qin and Luo 2014). To identify risks of a financial crisis, we first need to set a parameter threshold so that the model can signal when the estimated probability of a crisis exceeds that threshold. Typically, the in-sample crisis probability is chosen as the threshold. The in-sample probabilities of financial crisis, banking crisis, currency crisis and sovereign debt crisis are 5.14 per cent, 3.27 per cent, 2.49 per cent and 3.63 per cent, respectively, as shown in Table 10.5.

The model has correctly signalled a crisis for 82 per cent of financial crises, 81 per cent of banking crises, 95 per cent of currency crises and 78 per cent of sovereign debt crises, and in the same order has successfully predicted non-crisis for 76 per cent, 77 per cent, 58 per cent and 77 per cent, respectively. The Type I error—that is, the probability of incorrect rejection of financial crisis when crisis actually occurs—is between 5 per cent and 22 per cent, while that of a Type II error (failure to reject a financial crisis when crisis does occur) is between 23 per cent and 42 per cent. Generally speaking, the predictive power of our model is good, especially for the currency crisis model that predicted correctly 95 per cent of the time.

Table 10.5 Performance of the early warning system

	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
Threshold	5.14%	3.27%	2.49%	3.63%
(a) No crisis occurs				
(i) No signal	633	621	458	617
(ii) Signal	142	148	325	170
(b) Crisis occurs				
(i) No signal	10	6	1	6
(ii) Signal	32	20	19	20
Statistics				
(1) The percentage of correct classification	76	77	59	77
(2) The proportion of signals conditional on crises occurring	82	81	95	78
(3) Type I error	18	19	5	22
(4) Type II error	24	23	42	23

Source: Authors' summary.

Robustness check

Our baseline results could be subject to statistical error, which affects the reliability of the findings.

To understand these risks, we conduct some robustness checks. First, we substitute the indicator for capital account liberalisation with the one constructed by Abiad et al. (2008) (*Kaopen2*) for the index constructed by Quinn and Toyoda (2008) to reduce the risk of measurement error. The results are reported in Table 10.6. The results are similar to the benchmark model, in which the coefficient on capital account opening is positive and significant, and its cross-term with domestic financial liberalisation is negative and significant. This reconfirms the earlier result that indicates greater reform of the domestic financial system serves to decrease the crisis risks attached to capital account opening. We also check the influence of different types of domestic financial reforms, and find that banking system reform appears to be important in its association with reducing the harmful risks of capital account opening—confirming the results of the basic model.

The second robustness check is to add more control variables to the baseline model. In this case, we focus on the government deficit.³ Results of this new model, presented in Table 10.7, show that financial reform is associated with

³ This is not included in the basic model because this variable greatly reduces our final sample.

different outcomes of capital account liberalisation, except that in the case of the currency crisis that association is not significant. Therefore, we believe our basic model is robust.

Table 10.6 Robustness check: Alternative indicators

	(1)	(2)	(3)	(4)
Variables	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
Kaopen2	0.3613**	0.3543*	0.3134	0.3302
	(0.1791)	(0.2065)	(0.2446)	(0.2056)
Kaopen2_domestic	-1.6786***	-1.7735**	-1.4610*	-1.7154**
	(0.6025)	(0.6894)	(0.8596)	(0.6887)
Fixed EXR	-0.4949	0.0212	-1.0102	0.0038
	(0.4062)	(0.4600)	(0.6400)	(0.4562)
Intermediate EXR	0.0116	0.0621	0.0343	0.0371
	(0.2987)	(0.3615)	(0.4493)	(0.3581)
GGDP	-2.8160	1.2572	-6.2683**	1.1852
	(2.1244)	(2.5853)	(2.7557)	(2.5815)
Log(GDP)	-0.1668**	-0.0731	-0.1869*	-0.0670
	(0.0755)	(0.0893)	(0.1058)	(0.0888)
Inflation	0.1808	0.2117	0.1573	0.1988
	(0.1648)	(0.2085)	(0.2066)	(0.2095)
M2_reserve	0.3913**	0.1093	0.6866***	0.0936
	(0.1736)	(0.2363)	(0.2187)	(0.2216)
Real interest	0.5818	2.0562**	-0.5710	1.9475**
	(0.7869)	(0.9120)	(1.0913)	(0.9040)
Real exchange rate overvaluation	0.0110**	0.0065	0.0145***	0.0060
	(0.0046)	(0.0065)	(0.0053)	(0.0065)
Current account surplus (% of GDP)	-2.5654	-2.6430	-2.6088	-2.4709
	(1.8175)	(2.0860)	(2.7121)	(2.0766)
Financial development	0.0033	0.0037	0.0018	0.0034
	(0.0027)	(0.0032)	(0.0041)	(0.0031)
Predicted probabilities	5.19%	3.40%	2.55%	3.25%
Observations	817	795	803	813
No. of countries	50	50	50	50
R-squared	0.140	0.102	0.260	0.096

*** p<0.01

** p<0.05

* p<0.1

Note: Standard errors are in parentheses.

Source: Authors' estimations.

Table 10.7 Robustness check: Alternative control variables and samples

	(1)	(2)	(3)	(4)
Variables	Crisis	Banking crisis	Currency crisis	Sovereign debt crisis
Kaopen	5.5497*	7.2340*	78.9570	7.1280*
	(2.9560)	(4.2125)	(0.0000)	(4.2784)
Kaopen_domestic	-7.0235**	-8.7139**	-77.5441	-8.4916**
	(2.7593)	(3.9870)	(0.0000)	(4.0445)
Fixed EXR	2.5600	2.6641	-77.8428	2.7100
	(461.3604)	(624.5154)	(0.0000)	(732.6701)
Intermediate EXR	3.5700	3.6512	-17.3689	3.6532
	(461.3589)	(624.5133)	(0.0000)	(732.6683)
GGDP	-4.3000	-6.4972	-183.6347	-6.8148
	(8.0252)	(9.4391)	(0.0000)	(9.3527)
Log(GDP)	0.1214	0.1800	-6.6217	0.2203
	(0.3811)	(0.4933)	(0.0000)	(0.4926)
Inflation	-0.0475	-0.1484	-45.8003	-0.1721
	(0.4666)	(0.4530)	(0.0000)	(0.4645)
M2_reserve	0.1466	-2.4797*	21.6464	-2.6337*
	(0.3573)	(1.3089)	(0.0000)	(1.3714)
Real interest	-1.1628	-0.5035	29.2760	-0.5415
	(2.5250)	(2.8508)	(0.0000)	(2.8854)
Real exchange rate overvaluation	0.0379	0.0263	3.8286	0.0258
	(0.0346)	(0.0425)	(0.0000)	(0.0430)
Current account surplus (% of GDP)	-12.3877	-16.5165	88.5961	-16.7613
	(7.5535)	(11.7872)	(0.0000)	(12.1869)
Financial development	0.0073	0.0111	0.1996	0.0077
	(0.0081)	(0.0113)	(0.0000)	(0.0102)
Gov_deficit	-0.0644	-0.0758	0.6441	-0.0828
	(0.0677)	(0.0798)	(0.0000)	(0.0811)
Predicted probabilities	1.50%	2.54%	1.64%	1.58%
Observations	315	311	312	314
No. of countries	45	45	45	45
R-squared	0.487	0.497	1.000	0.483

*** p<0.01

** p<0.05

* p<0.1

Note: Standard errors are in parentheses.

Source: Authors' estimations.

Four scenarios for China by 2020: Probability of financial crisis under different reform sequences

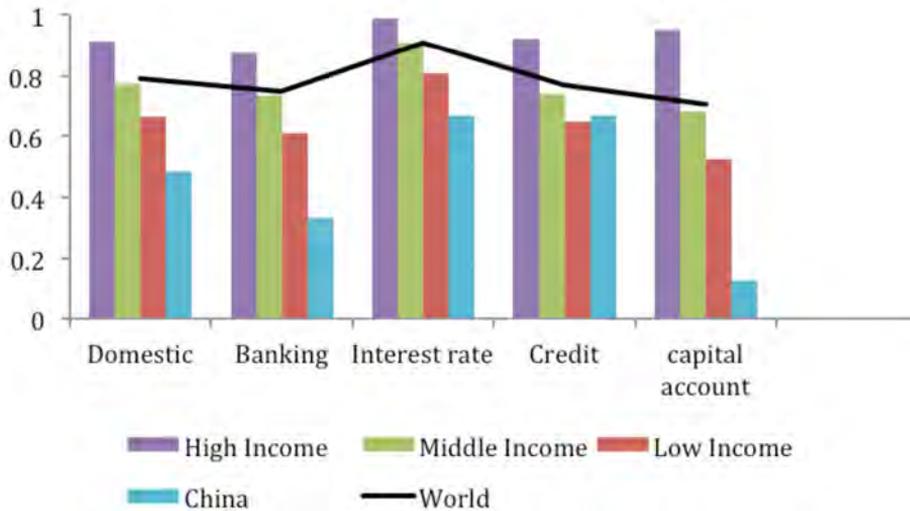


Figure 10.2 China's financial reform: Cross-country comparison

Sources: Abiad et al. (2008); and authors' calculations.

China's financial system is relatively repressed in several dimensions, even when compared with low-income economies, as shown in Figure 10.2. The degree of capital account opening and domestic financial system liberalisation, including the banking system, interest rate formation and credit allocation, is low.

China is on track to speed up implementation of market-oriented reforms in the financial system, both internally and externally. It is therefore important to understand whether the sequence of domestic financial reforms and capital account opening is important. To more specifically draw policy implications for China, we analyse a multi-country dataset to investigate how the sequence of financial reform affects financial risk.

Based on our empirical model and results, we also predict the probabilities of financial crisis under different scenarios of reform sequencing.

In the first instance, we explore the different sequences of domestic financial reforms as a whole and with capital account opening. We assume four related scenarios as follows:

- **Scenario one** assumes that capital account opening precedes liberalisation of the domestic financial system, and also that the capital account is opened in a single period following a big-bang pattern. Specifically, we assume

China fully liberalises the capital account to the average level of high-income economies in 2015 while domestic financial reform retains its present status.

- **Scenario two** assumes that capital account opening precedes liberalisation of the domestic financial system but capital account opening takes place gradually. Specifically, we assume that China gradually liberalises the capital account to the average current opening level of high-income economies by 2020 while putting domestic financial reforms on hold.
- **Scenario three** assumes that China gradually and concurrently liberalises the capital account and the domestic financial system to the current average opening level of high-income economies by 2020.
- **Scenario four** assumes that China liberalises its domestic financial system before achieving full capital account opening. Specifically, we assume that China gradually liberalises the domestic financial sector to the current average opening level of high-income economies by 2017, while gradually liberalising its capital account to the current average opening level of high-income economies by 2020.

The assumptions of all the other variables used in the perdition model are described in Appendix Table A10.3. Table 10.8 reports the predicted probabilities of experiencing a financial crisis in the years 2015–20 under the four scenarios. In our empirical model, the probability of crisis is regressed on lagged capital account opening and domestic financial reform variables—that is, reform in 2015 affects the crisis propensity in 2016, and so on.

Table 10.8 Scenario analysis: Sequence and speed of domestic financial reform and capital account opening—Percentage chance of experiencing crisis

Type of crisis	2015	2016	2018	2020	2016–20 average
Scenario 1: Big-bang reform of capital accounts in 2015 without domestic financial system reform					
Crisis	9	14	14	14	14
Banking crisis	8	11	11	11	11
Currency crisis	27	3	3	3	3
Sovereign debt crisis	7	10	10	10	10
Scenario 2: Gradual reform of capital accounts until 2020 without domestic financial system reform					
Crisis	9	10	12	14	12
Banking crisis	8	8	9	10	9
Currency crisis	2	2	3	3	3
Sovereign debt crisis	7	7	8	9	8
Scenario 3: Gradual reforms of both capital account and domestic financial system until 2020					
Crisis	9	9	8	6	7
Banking crisis	8	7	6	4	6
Currency crisis	2	2	2	1	1

Type of crisis	2015	2016	2018	2020	2016–20 average
Sovereign debt crisis	7	7	5	4	5
Scenario 4: Gradual reform of capital account until 2020 and gradual reform of domestic financial system until 2017 (achieving full liberalisation of domestic financial system earlier than of capital account)					
Crisis	9	7	5	5	6
Banking crisis	8	6	4	3	4
Currency crisis	2	2	1	1	1
Sovereign debt crisis	7	6	3	3	4

Source: Authors' summary.

Under scenario one, when a big-bang opening of the capital account takes place without additional reforms to the domestic financial system, the model predicts a big jump in the likelihood of China experiencing a financial crisis in 2015–16. The likelihood rises further—to 14 per cent—by 2020. Applying the same reform assumptions to each type of crisis delivers similar predictions. China is somewhat likely to experience a banking crisis and a sovereign debt crisis during 2016–20, with an average probability of 11 per cent and 10 per cent, respectively. Following the sequencing assumptions of scenario one would be relatively risky for China.

The model predicts smaller probabilities of experiencing each type of financial crisis under scenario two than under scenario one. The difference lies in the much more gradual capital account liberalisation for China, though the difference does not eliminate the probability of China experiencing a crisis. In scenario two, the likelihood of China experiencing a financial crisis is 12 per cent, on average, in 2016–20. Moreover, there is lower likelihood under these assumptions that China will experience a banking and sovereign debt crisis.

The picture changes dramatically under scenario three and scenario four. When China reforms its domestic financial system at least as soon as it reforms the capital account, the probability of crisis falls significantly. Compared with scenario two, China is assumed to gradually liberalise its domestic financial system concurrently with a gradual liberalisation of the capital account from 2015 to 2020. Reform of the domestic financial system appears to serve as a buffer against the risk of shocks, which then leads the likelihood of crisis to fall annually, and reach less than 6 per cent by 2020. China similarly faces a smaller likelihood of experiencing each type of crisis under scenario three.

Under scenario four, China realises full liberalisation of the domestic financial system in 2017, ahead of realising full liberalisation of the capital account, which happens in 2020. The model predicts that crisis probability falls to an average of 6 per cent. The likelihood of experiencing each type of crisis also decreases. In other words, a more liberalised domestic financial system, with

a more competitive banking system, more liberalised interest rates and a more market-oriented credit allocation mechanism, serves to increase the overall stability of China's financial system.

Trends among the predicted probabilities of experiencing different types of financial crises are depicted in Figure 10.3. This shows clearly that from scenario one to scenario four, the probabilities decrease by year for each type of crisis from 2016. This offers striking evidence that gradual liberalisation in China's case would be safer than a big-bang reform of the capital account (see the difference between scenario two and one), and also that advanced or concurrent domestic financial system liberalisation would serve to buffer against capital account opening shocks and similarly to reduce related crisis probabilities (the difference between scenarios two and three). This is more clearly so where full domestic liberalisation is achieved in advance of capital account opening (the difference between scenarios three and four).

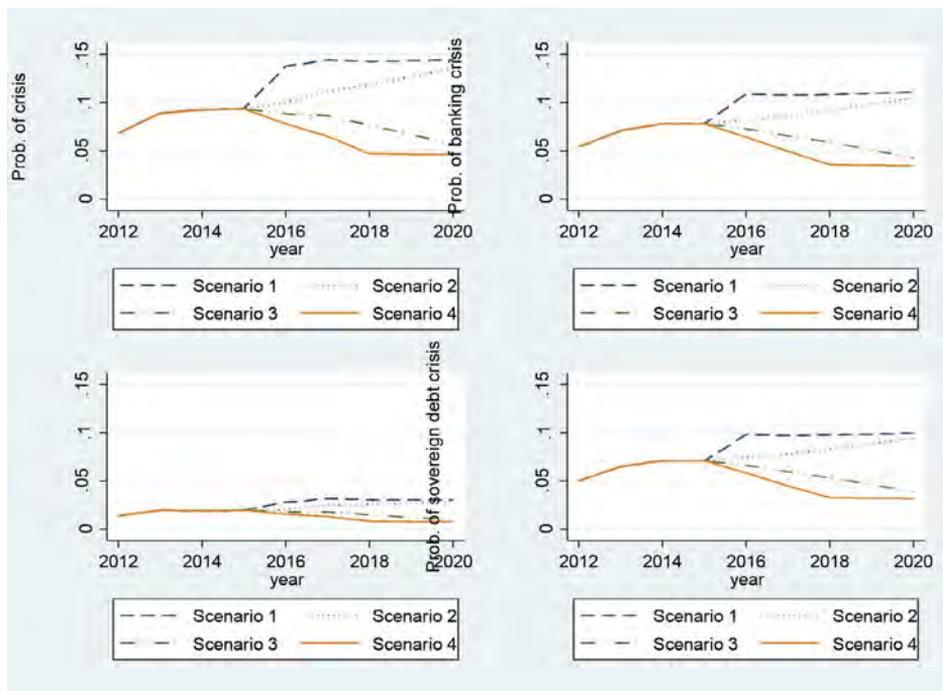


Figure 10.3 Scenario analysis: Domestic financial reform and capital account opening

Notes: Scenario one assumes big-bang reform of the capital account in 2015 without domestic financial system reform; scenario two assumes gradual reform of the capital account until 2020 without domestic financial system reform; scenario three assumes gradual reform of both the capital account and the domestic financial system until 2020; scenario four assumes gradual reform of the capital account until 2020 and gradual reform of the domestic financial system until 2017, which means China achieves full liberalisation of the domestic financial system earlier than of the capital account.

Source: Authors' summary.

We further examine the effects of different sequences and speeds for banking system reform and capital account opening. As before, we assume four scenarios and predict crisis probabilities. The only difference is that here we substitute reform of the whole domestic financial system for domestic banking sector reform. The predicted probabilities under four scenarios are depicted in Figure 10.4.

Figure 10.4 shows a similar pattern: from scenario one to scenario four, crisis probabilities become lower and lower. This again supports two propositions. First, gradual liberalisation is much safer than big-bang reform in capital account opening. Second, domestic banking system reform is important in reducing the financial risks of further capital account liberalisation.

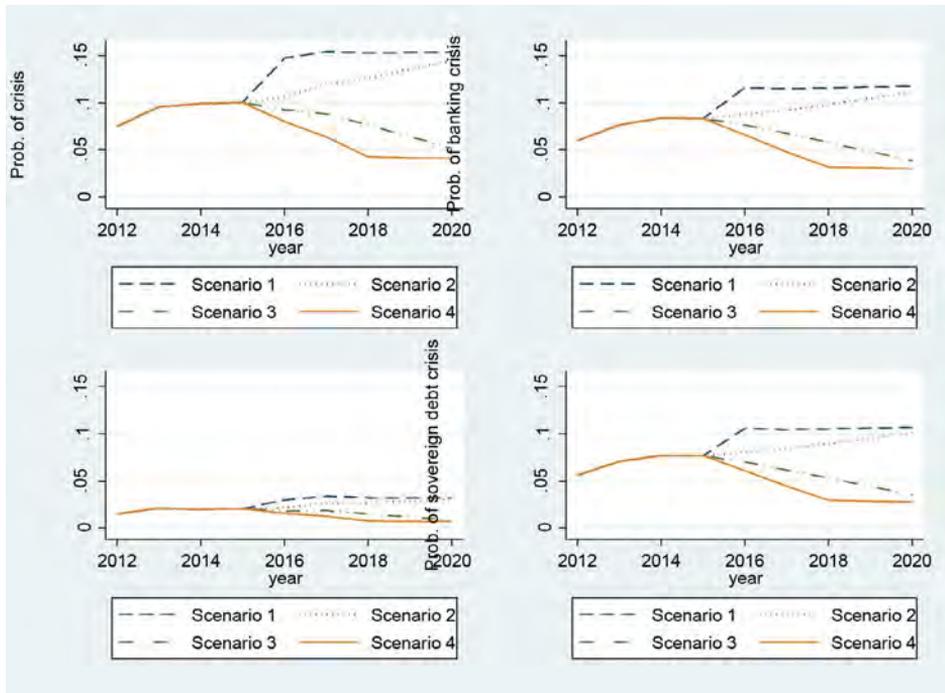


Figure 10.4 Scenario analysis: Banking system reform and capital account opening

Notes: Scenario one assumes big-bang reform of the capital account in 2015 without domestic banking system reform; scenario two assumes gradual reform of the capital account until 2020 without domestic banking system reform; scenario three assumes gradual reform of both the capital account and the domestic banking system until 2020; scenario four assumes gradual reform of the capital account until 2020 and gradual reform of the domestic banking system until 2017, which means China achieves full liberalisation of the domestic banking system earlier than of the capital account.

Source: Authors' summary.

Finally, we predict probabilities of crisis under similar scenarios for different sequences of credit allocation reform and capital account opening. The results are shown in Figure 10.5. Although the difference of the predicted crisis probabilities is smaller between different scenarios, scenarios three and four are still much safer policy paths than scenarios one and two. Therefore, gradual reform of the capital account and earlier domestic financial reform are important.

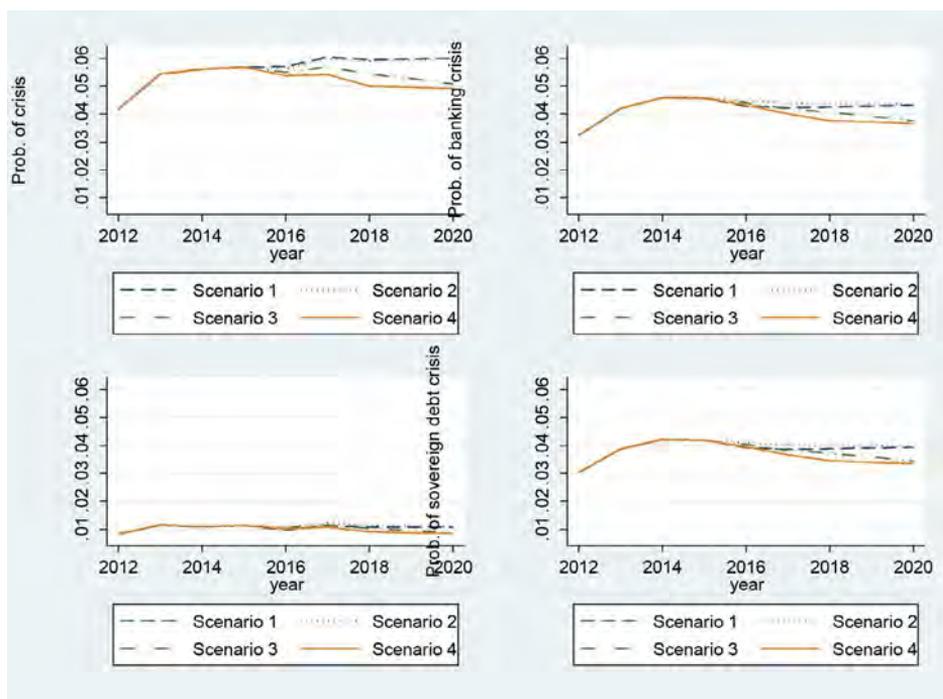


Figure 10.5 Scenario analysis: Credit allocation reform and capital account opening

Notes: Scenario one assumes big-bang reform of the capital account in 2015 without domestic credit allocation system reform; scenario two assumes gradual reform of the capital account until 2020 without domestic credit allocation system reform; scenario three assumes gradual reforms of both the capital account and the domestic credit allocation system until 2020; scenario four assumes gradual reform of the capital account until 2020 and gradual reform of the domestic credit allocation system until 2017, which means China achieves full liberalisation of the domestic credit allocation system earlier than of the capital account.

Source: Authors' summary.

In summary, the results suggest that the financial risks that China could suffer during the process of financial reform would be lower if China were to implement domestic financial system reform before capital account liberalisation, and also to achieve capital account liberalisation gradually. Among domestic financial system reforms, banking system reform appears to be especially important.

This refers to lowering banking market entry barriers, improving the equality of access to private capital, and strengthening the regulation and supervision of banks.

Conclusion

Within the financial liberalisation sequencing literature there are different schools of thought. In one, economists believe that the opening of the capital account should be the last step of economic liberalisation in transitional economies so as to avoid risks of financial instability—that is, policy sequencing should be used in the process of financial reform, meaning that domestic financial reform can be pursued in advance of full removal of capital controls. This relates to the fact that premature liberalisation of the capital account can invite excessive capital inflows that ultimately produce a boom–bust cycle in economies where the domestic financial sector is sufficiently distorted and constrained, or simply underdeveloped.

Another school of thought argues that trade reforms and capital account liberalisation should precede the entire process of economic reform because foreign competition and related spillovers reduce the resistance of interest groups that stand against domestic financial and other internal economic reforms. Finally, one group of economists believes that no sequence at all should be followed—that is, emerging market economies can undertake all reforms, domestic and external, simultaneously. This is because this dramatic reform strategy removes all market distortions in a single shot and therefore significantly reduces the costs associated with reforms and allows the benefits of reform to come earlier.

Using a cross-country panel dataset of 50 economies during the period 1973–2005, our empirical study identified substantial effects of the sequencing of financial reforms on the likelihood of an economy experiencing a financial crisis. Specifically, the liberalisation of the capital account can increase the likelihood of experiencing a crisis, while domestic financial system reforms reduce the risks of a crisis resulting from the potential volatility of an open capital account. Specifically, reform of the domestic banking sector and removal of credit controls tend to have a substantial impact on the mitigation of financial risks induced by capital account opening, while the impact of interest rate liberalisation remains unclear.

After three decades of economic transition that have left the financial sector comparatively untouched, China has pledged to deepen its financial sector reforms. At the Third Plenary meeting of the Eighteenth National Congress of the Chinese Communist Party in November 2013, a comprehensive plan for

these reforms was announced, to take place from now until 2020. Among these reforms, financial sector liberalisation is obviously one of the more significant. Related policy areas include lowering market entrance to the banking sector, interest rate liberalisation, capital market development, establishment of a deposit insurance system, improvement of financial regulation, increased exchange rate flexibility and capital account convertibility. It is widely believed that success in financial sector reform is of great importance to China's structural adjustment and long-term economic development.

To reduce the associated risks and increase the chance of success of China's financial reforms, the right policy sequence is crucial. Our scenario analysis suggests that if China fully liberalises its capital account using a big-bang model in 2015 in the absence of sufficient domestic financial sector reform, especially reform of the banking sector, there is about a 14 per cent probability of experiencing a financial crisis during 2016–20. The likelihood falls to 12 per cent if China gradually liberalises its capital account, without domestic financial reforms. And, finally, gradual reform of the capital account combined with advanced completion of domestic financial reforms reduces the predicted probability of crisis—to 6 per cent during 2016–20 in our model.

Although there has been a strong push to fully liberalise the capital account, this study suggests that acceleration of domestic financial reforms is a more urgent task. Among others, state-owned banking reforms, interest rate liberalisation, together with building up a deposit insurance system and enhancing the role of capital markets, should be policy priorities. To maintain the independence of monetary policy and to mitigate currency speculation under a more open capital account, a significant increase in the flexibility of the renminbi exchange rate is also imperative.

A contrasting argument—one in favour of accelerating capital account liberalisation—is that it will benefit the process of renminbi internationalisation, and that this is good for building a new international monetary system as well as for China (Zhang and Tao 2015). It is true that a more open capital account is necessary for the internationalisation of the renminbi, particularly where the renminbi will serve as an international reserve currency. It is not necessarily the case, however, that there will be no progress on renminbi internationalisation until China has fully liberalised its capital account. The rapid development of the Hong Kong offshore renminbi market in recent years has shown that renminbi internationalisation can progress even where China retains selective capital controls. In fact, the euro dollar market in the 1950s and 1960s provides an interesting historical precedent for such a process. In that case, the US dollar became much more influential as an invoice and settlement currency through the offshore market, while the US domestic financial market retained many restrictions, including controls on cross-border capital movement.

Prudent strategy in capital account liberalisation is advised not only on the basis of this chapter's risk assessments, but also in the context of China's less stable macroeconomic situation. Risks include rapid increases in local government debt, a fragile shadow banking system and continuous cooling of the real estate market. Moreover, fake invoicing of cross-border trade transactions and fictional outward service payments have combined to allow capital flight in the past year or so. In the context of these potentially unstable macroeconomic and financial circumstances, the findings of this study suggest that rapid and full removal of capital controls could induce serious challenges to China's financial stability in the short run. Research towards better understanding the effects of financial policy sequencing on the soundness of financial opening, especially in the case of a large economy like China's, is required urgently.

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Appendix

Table A10.1 Variables definition and data sources

Variable	Definition	Source
Crisis	Dummy variable taking a value of one if at least one of systemic banking, currency or sovereign debt crisis arises, and zero otherwise	Laeven and Valencia (2013)
Banking crisis	A systemic banking crisis is defined as either a significant sign of financial distress in the banking system or a severe banking policy intervention. A dummy variable is equal to one where any of these arise, and zero otherwise	Laeven and Valencia (2013)
Currency crisis	A currency crisis is defined as a nominal depreciation of the currency against the US dollar of at least 30 per cent that is also at least 10 percentage points higher than the rate of depreciation in the preceding year. A dummy variable is equal to one in these cases, and zero otherwise	Laeven and Valencia (2013)
Sovereign debt crisis	A sovereign debt crisis is defined as a sovereign debt default and where there is a need for sovereign debt restructuring. A dummy variable is equal to one in these cases, and zero otherwise	Laeven and Valencia (2013)

Variable	Definition	Source
Kaopen	Measures the degree of liberalisation of the capital account	Quinn and Toyoda (2008)
Kaopen2	A measure of the degree of liberalisation of the capital account	Abiad et al. (2008)
Fin_domestic	Captures domestic financial reform along five different dimensions: credit controls and reserve requirements, interest rate controls, entry barriers, state ownership, and banking regulations	Abiad et al. (2008)
Fin_bank	A measure of banking system reform, including entry barriers to the banking sector, state ownership of banks and regulations, and supervision of the banking sector	Abiad et al. (2008)
Fin_interest	A measure of the liberalisation of the interest rate	Abiad et al. (2008)
Fin_credit	A measure of the liberalisation of credit allocation	Abiad et al. (2008)
Fixed EXR	A dummy variable equal to one in cases of a fixed exchange rate regime, defined to include classification of 1) no separate legal tender; and 2) a pre-announced peg or currency board arrangement, and equal to zero otherwise	Ilzetzi et al. (2011)
Intermediate EXR	A dummy variable indicating an intermediate exchange rate regime, defined to include classification of 3, pre-announced horizontal band $\leq \pm 2\%$; 4, de facto peg; 5, pre-announced crawling peg; 6, pre-announced crawling band $\leq \pm 2\%$; 7, de facto crawling peg; 8, de facto crawling band $\leq \pm 2\%$; 9, pre-announced crawling band $\geq \pm 2\%$; 10, de facto crawling band $\leq \pm 5\%$; 11, moving band $\leq \pm 2\%$; and 12, managed floating	Ilzetzi et al. (2011)
Float EXR	Dummy variable indicating a floating exchange rate regime. It includes classification of 13, freely floating	Ilzetzi et al. (2011)
GGDP	Growth rate of real GDP per capita (purchasing power parity)	World Bank (2014)
LogGDPP	Log term of real GDP per capita (purchasing power parity)	World Bank (2014)
Inflation	Inflation rate as measured by the consumer price index	World Bank (2014)
M2_reserve	M2/reserve	World Bank (2014)
Real interest	Real interest rate	World Bank (2014)
Real exchange rate overvaluation	Deviation of real effective exchange rate from trend (obtained from HP filter, smoothing parameter 100)	World Bank (2014)
Current account surplus	The surplus of current account/GDP	World Bank (2014)
Financial development	Private credit/GDP	World Bank (2014)
Gov_deficit	Government fiscal deficit/GDP	World Bank (2014)

Table A10.2 Statistical description of variables

Variable	Obs	Mean	Median	Std dev.	Min.	Max.
Crisis	820	0.05	0	0.21	0	1
Banking crisis	796	0.03	0	0.17	0	1
Currency crisis	800	0.02	0	0.14	0	1
Sovereign debt crisis	816	0.03	0	0.17	0	1
Kaopen	820	0.74	0	0.27	0.125	1
Kaopen2	820	0.74	1	0.35	0	3
Fin_domestic	820	0.66	0.73	0.26	0	1
Fin_bank	820	0.59	0.67	0.29	0	1
Fin_interest	820	0.82	1	0.34	0	3
Fin_credit	820	0.69	0.67	0.32	0	3
Fixed EXR	820	0.14	0	0.34	0	1
Intermediate EXR	820	0.74	1	0.44	0	1
GGDP	820	0.02	0.02	0.04	-0.15	0.30
LogGDPP	820	8.69	9.31	1.48	5.13	10.61
Inflation	820	0.09	0.05	0.39	-0.03	10.58
M2_reserve	820	0.06	0.01	0.38	-0.94	3.58
Real interest	820	0.07	0.06	0.10	-0.71	0.94
Real exchange rate overvaluation	820	-8.94	-0.06	102.71	-1,678.56	153.44
Current account surplus	820	-0.01	-0.01	0.06	-0.18	0.33
Financial development	816	58.05	49.48	40.61	2.21	196.48
Gov_deficit	286	0.42	0.41	4.60	-15.79	11.26

Note: The definition and data source of each variable correspond with those described in Table A10.1.

Table A10.3 Assumptions for projecting financial crisis

Variable	Assumption
Kaopen	The index from Quinn and Toyoda (2008) is updated only until 2011. According to the IMF's <i>AREAER</i> (IMF 2014), China has only had one major policy change in the capital account transactions from 2012 to 2014, which was the relaxing of controls on derivatives and other instruments. Using this as a reference, we augment the Quinn and Toyoda (2008) database for 2011–14, via a marginal increase in China's capital account opening score, from 0.5 in 2011 to 0.55 in 2014. From 2015 to 2020, this is assumed to follow each of four scenarios, which are described in detail in section four
Fin_bank	The index from Abiad et al. (2008) is updated only up to 2005. We update the series, including an adjustment to the banking sector-controlling index proportionally to reflect the large state-owned banks' market share of loans from 2005 to 2014, as sourced from the China Banking Regulatory Commission. From 2015 to 2020, this is assumed to follow each of four scenarios, which are described in detail in section four

Variable	Assumption
Fin_interest	The index from Abiad et al. (2008) is updated only to 2005. We adjust the interest rate liberalisation index to 2.25 in 2014 from 2.0 in 2005—an augmentation that reflects the expansive floating range of the interest rate in 2012 and the removal of the floor on the baseline loan rate in 2013
Fin_credit	The index from Abiad et al. (2008) is updated only to 2005. We adjust the credit liberalisation index to 2.5 in 2014 from 2.25 in 2005. From 2015 to 2020, this is assumed to follow each of four scenarios, which are described in detail in section four
Fin_domestic	We update the index based on the updated index of banking, interest rate and credit controls to 2014. From 2015 to 2020, this is assumed to follow each of four scenarios, which are described in detail in section four
Intermediate EXR	We assume China maintains its current exchange rate regime until 2020
GGDP	The World Bank (2014) reports data until 2013. Growth rate of GDP per capita data for 2014 are obtained from the National Bureau of Statistics. We assume the GDP per capita growth rate will be 7 per cent in 2015 and 6.1 per cent from 2016 to 2020, based on Cai and Lu (2012)
LogGDPP	We predict GDP per capita during 2015–20 according to the predicted growth rate of GDP per capita based on Cai and Lu (2012)
Inflation	The World Bank (2014) reports data until 2013. We assume an inflation rate of 2.6 per cent from 2015 to 2020, which is average inflation between 2008 and 2013, and obtain the inflation rate for 2014 from the National Bureau of Statistics
M2_reserve	The World Bank (2014) reports data until 2013. From 2014 to 2020, we assume the ratio of M2 over reserves will grow at 2.5 per cent year-on-year, which is the average growth of the ratio between 2008 and 2013
Real interest	The World Bank (2014) reports data until 2013. We assume the rate to be 4.2 per cent from 2014 to 2020 onwards, which is the rate in 2013
Real exchange rate overvaluation	The World Bank (2014) reports data until 2013. We assume this rate to be 0.74 annually from 2014 to 2020, the period average value from 2008 to 2013
Current account surplus	The World Bank (2014) reports data until 2013. For 2014, we use data directly from the National Bureau of Statistics. Global economic prospects from the World Bank indicators predict the ratio of China's current account surplus over GDP until 2017, which is 2 per cent. And we assume it stays constant from 2018 to 2020
Financial development	The World Bank (2014) reports data until 2013. From 2014 to 2020, we assume the ratio of credit over GDP will grow at 1.27 per cent year-on-year, which is the average growth of the ratio between 2004 and 2013

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