

Is China's Financial Sector Reform the Answer to Economic Globalisation?

Lucia Morales* • Bernadette Andreosso-O'Callaghan**

Abstract The Chinese banking system is of interest to the analysts and scholars who seek to understand whether China's financial reforms are susceptible to contribute to the needed conditions that support fast economic growth and development. Before the Global Financial Crisis, China's economy was growing rapidly, and the country has now embarked upon a "*new normal economic model*." This entails a greater development scope for China's financial system. "*The Big Four*" Chinese commercial banks remain under the control and surveillance of the central government, a situation that raises significant criticisms among those who support banking deregulation, liberalisation and efficiency. However, China has shown that it was relatively prepared to manage two major crises – the Asian Economic and Financial Crisis, and the Global Financial Crisis – and that the close monitoring of its financial system should not be too easily dismissed. The main findings from this study highlight that the "*Big Four*" do not seem to be impacted upon by regional or global uncertainty, but that causal dynamics exist between Chinese top banks and regional market uncertainty, a phenomenon that needs to be carefully considered by policy makers.

Keywords: "The Big Four"; Financial Reform; Economic and Policy Uncertainty; Market Models; Dynamic Causality.

JEL Classification: F36; G15; G18

Introduction

In November 2013, with the 18th Party Congress Third Plenum Decision, the Party's Central Committee called for significant reforms in favour of changes to its economic model towards a more decisive role played by market forces. With its ongoing economic reforms since the late 1970s, the Chinese economic model has evolved over the years from being a centrally planned economy to allowing market forces to play some significant role. When compared to the rest of the world economies,

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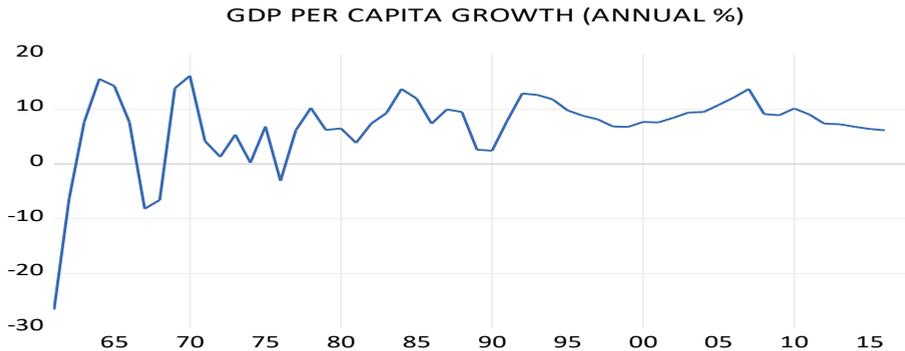
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China's economy has grown rapidly for several decades (see figure 1 below) and it has shown an extraordinary resilience to regional and international shocks. Chinese leaders have played a major starring role in the country's performance and the planning system has outlined a very ambitious agenda for the years to come. Efforts have been made to seek for substantial financial reforms that aim to support its growth strategy, a strategy that has lately been supported by the encouragement of domestic demand and innovation, and more engagement with regional economies in the context of a more equitable and environmentally friendly economy (Min, et al., 2018).

Figure 1: China's GDP Growth Rate



*Source: DataStream (2018)

As the country progressed with its reforms, the Global Financial Crisis hit the world economies and acted as a breakpoint for China. The country's growth rates slowed down, and new macroeconomic policies needed to be implemented to guide the economy towards a more active investment approach that helped to stabilise and keep high levels of growth. Chinese authorities realised that double digit growth rates might have come to an end, and that the country's economic performance has transitioned towards a "new normal" economic growth state. But, at the centre of the needed reforms, we find an archaic financial system, a system that is entrenched, rigid and heavily dominated and monitored by the government. China's financial institutions are heavily controlled by the state that, with continuous intervention, creates structural inertia hampering the well-functioning of its financial system where the banking sector plays a prominent role. Some relevant facts to be considered are: a) the state-owned banks have control of almost 60 percent of the country's banking sector assets, b) and state-owned enterprises account for more than 90 percent of the capital raised in China's corporate bond market. These facts offer a clear picture of the dominant role played by the state in the Chinese financial system. Consequently, in this study we examine whether the banking sector has managed to increase its level of resilience to uncertainty by analysing China's four top listed banks known as "the Big Four"; this is done in the context of two market models and spectral (dynamic) causality that seek to understand if China's Economic and Political uncertainty are a driver of uncertainty to the country's banking sector. Global market and regional economic and

political uncertainty are also considered by developing an empirical framework that integrates four indexes that proxy for market and economic policy uncertainty: i) the Chinese Economic Policy Uncertainty index (EPUi); ii) the World's Economic Policy Uncertainty index (Global EPUi); iii) the Hang Seng Volatility Index (HSI Vix); iv) and the VIX index are integrated as part of this study, with the aim of understanding if the "Big Four" are showing resilient features to global and domestic uncertainty, in the context of statistic and dynamic causality modelling that allows to examine the banks performance.

Research Motivation

The study seeks to examine the following issues: i) what is the role of the financial system in the shaping of a strong economic model? and ii) why is China in dare need of introducing changes to its financial system? An initial issue to consider is that financial institutions play a core role in a country's economic success, as they facilitate investment that yields higher levels of productivity and foster innovation that contributes to economic growth, development and that raises living standards. A second issue of interest can be found in the role of financial institutions when determining the quantity and quality of investment. They facilitate the collection of savings and the selection of projects in which to invest those savings. The financial system is responsible for the provision of corporate governance and the legal systems make sure that those investments are used in an effective manner. Therefore, financial institutions can be considered as the conduit for quality investment, as through them, financial resources are collected and administered to select optimal projects where to allocate scarce financial resources in an efficient manner. Moreover, they provide the channels and a legal framework that guarantee the effective use of financial resources. Without doubt, the Chinese authorities are facing many challenges when looking at the reform of their financial system. Without significant reforms, China's rigid financial system will remain trapped in a cycle of inefficient investment and rising inequality, as China's financial markets remain remarkably underdeveloped by international standards (Nazmi, 2006; Min et al, 2018; Paulet and Relano, 2018). Another aspect that needs attention relates to the state intervention and controls on financial flows that can undermine the country's ability to become a competitive international player with sound governance rules and guidelines.

This paper offers first a brief overview of China's financial system that will help position the study. As such, it is of interest to explore the Chinese financial system and how its financial structure has evolved to identify the kind of challenges that economic and financial authorities are facing as they look to implement much-needed reforms. There is no argument around China's needs to transform its underdeveloped financial system into a competitive one that aligns with international standards. However, we also need to remember that China's financial system managed to remain stronger during the GFC, while the world's most developed economies were submerged in a deep recessionary period that shambled their financial system. Then, it is important to consider that China might not be interested in developing a model that mimics those

of Western economies; rather, it aspires at borrowing key aspects that can strengthen its model whilst safeguarding other aspects of its “*traditional model*”; this is a lengthy process as the country needs to find its own way around existing models, until it finds the one that suits and supports its economy and political ideology.

A Brief Overview of China's Financial System and its Major Challenges

Over the years, researchers have been intrigued by China's economic growth that has been subject to many studies trying to decipher the country's ability to keep a consistent and rapid performance for more than a quarter of a century, since the economic reforms started in 1978, with important changes made in the banking sector (Yao et al., 2006; Zhang and Daly, 2011; Tan, 2014; Shen et al., 2009; Kobil and Dow, 2013; Min et al, 2018). The reforms sought a transition from a centralised, state-owned, monopolistic and policy driven approach to a model that shared some characteristics of well-developed banking systems that are decentralised, have multi-ownership, that are competitive and profit-oriented systems (Nazmi, 2006; Tan, 2014). Quite generally, China's financial system has been perceived as a weak system on the verge of collapse. The situation is quite different today, as the Global Financial Crisis showed how industrial countries' financial systems were badly affected, - systems that were considered to be efficient -; these liberalised and deregulated systems were met with severe liquidity problems, with major failures in terms of corporate governance, and with a serious inability to cope with global market demands. On the other hand, China managed to fend off strong external turbulences and the Chinese authorities were able to use their banking system to act as a key tool for the implementation of the largest fiscal stimulus package in the country's history (García-Herrero and Santabárbara, 2013). China's resilience to the global turmoil can be explained by its relative external isolation of its financial sector and by strong public intervention in credit allocation, along with lax monetary and fiscal policies. The typical criticism of an underdeveloped financial system in China helped to shield the country from the global mayhem. However, caution is needed, as the limited impact of the GFC on China's financial system should not lead towards the perception that its financial reforms have been sufficient. China needs to progress further with its efforts to reform its financial system and it should start by looking at the banking sector, as historically, Chinese banks have been used as the primary source of finance for state-owned companies and local governments (Dorrucci et al., 2009). While the banking system has become bigger and sounder in terms of solvency and asset quality, there is still a high degree of public intervention in credit allocation and of instances of financial repression that lead to a severe disruption in terms of competitive levels.

Timeline of China's Main Reforms to its Banking System

The Chinese authorities' main efforts to reform the country's financial system can be summarised as follows.

- In the late 1970s, the People's Bank of China (PBC) dominated the sector that

was considered a mono-bank banking system, and the PBC acted as a central bank and also as a commercial bank.

- During the 1980s, the PBC remained in charge of the country's monetary policy and also of its banking regulation. However, at that time, the Chinese authorities decided to separate the central bank and commercial bank functions. To achieve their objective, four state-owned commercial banks (SOCBS) were created, and at the same time smaller financial institutions were also settled and their operations were limited to the local and regional level.
- In the early 1990s, the Shanghai and the Shenzhen stock exchanges were re-established allowing China to open its doors to a capital market. However, at this time the country started to face problems with regard to non-performing loans (NPLs), as the creation of three policy banks continued to accumulate NPLs as bank lending was growing significantly without appropriate assessment of the underlying risks. The main role of the banks was to provide funds to state-owned enterprises (SOEs) without conducting assessments on their repayment capabilities as the state acted as a guarantor of last resort. As a result, and during the 1990s, China experienced a sharp reduction in economic growth in the wake of the Asian Crisis that can be associated with the rapid increase of non-performing loans. In 1998, the PBC started a multi-year restructuring process that aimed to clean up its banking system.
- The year 2000 witnessed the introduction of the reform process of banks and SOEs with the transfer of massive amounts of NPLs to newly created Asset Management Corporations. At least 2.5 trillion yuan (about \$300 billion) or 31 percent of China's GDP at the time were transferred from the banks' balance sheets to the newly created corporations.
- In 2003, a new institution was created – The China Banking Regulatory Commission (CBRC). CBRC was tasked to deal with the financial supervision and regulation of the financial system and it was in charge of continuing with the country's ambitious financial reform.
- Between 2003 and 2010, the China's commercial banking sector experienced rapid growth that led to its structural diversification.
- From 2013 onwards, the country was left with a dangerous legacy of non-performing loans (NPLs). Structural reforms were introduced with the aim of reducing huge loads of NPLs from the balance sheets of the "Big Four". At the same time, China's embraced the guidelines outlined by the Basel III Accord by introducing domestic rules and regulations that were stricter than those considered at the international level. The Basel Committee gave Chinese regulators the best possible overall grade of compliance, as China committed to tighter implementation of the Basel III schedule; this is perceived as a positive reform and as a commitment from the part of regulators to enhance and improve the sector's surveillance mechanisms.

In sum, China's vision to its financial system revolves around the introduction of prudential banking regulation that is far stricter than the standards settled at

international level, and the Chinese authorities are very committed to it, to the point that they are moving faster than anybody else on the implementation of the Basel III recommendations and that they are going much further than required. However, there are significant aspects that still need to be considered: i) Chinese banks have been shielded and instructed by their government for years, a strategy that has undermined their international competitive position, and that has created massive amounts of NPLs. ii) China's economic growth and the risks associated with its rooted socialist economy and its sustainability are driving the political discourse in a country that seeks to reform its financial system without losing control of its top banks.

As China becomes a new powerful global economic player - in a context of global ambiguity, led by the indecisive economic and political game played by the new US administration - there is a need of examining its financial system and its stability in terms of global and domestic uncertainty. While the Chinese financial sector appears to exhibit signs of stability, there is remarkable inner-party opposition as the central leadership tries to commit to further internationalisation (Andreosso-O'Callaghan and Gottwald, 2014). Strong political control from Beijing and vested interests are aspects that bring serious challenges and concerns to the government's efforts to introduce further reforms that contribute to China's aspirations of becoming a global and market-oriented economy (García-Herrero and Santabárbara, 2013; Andreosso-O'Callaghan, 2013). Economic reforms introduced in the 1980s and 1990s helped the country to achieve fast economic growth; however, the foundations of the model that is heavily reliant on exports has sacrificed productive efficiency that, with the outburst of the Global Financial Crisis, has led to significant questioning of its efficiency and sustainability among the political class. China's export-led growth model was heavily sustained by under-priced production factors and it has become obsolete (Fabre, 2013), opening the door to the development of the real estate and financial sectors that have taken momentum. The country is shifting from an economic model that relied heavily on its exports and on a foreign investment-led approach towards a model where the services sector appears to be taking central stage. In this regard, the need for liberalising and making more competitive the financial sector is an aspect that needs to be examined carefully, due to the critical role of financial services when supporting economic growth and development. This is particularly the case when sustainable economic growth is linked to the development of financial services that act as a stimulator to economic progress.

What are the Main Challenges Faced by the Chinese Banking System?

China's economic expansion and aspirations to become a major global economic player need to be supported by an agile, responsive and responsible banking system that is capable of keeping money flowing throughout its economy. Failing to introduce the needed changes will lead to severe financial implications with far reaching consequences at both the regional and global level in the long term. The Chinese authorities need to find a way of modelling their financial system that contributes to the country's economic development levels that align with those achieved by economic superpowers of the size

of the US, Japan and the EU. But to be able to compete at international level, China's financial industry needs to consider the commercial and the shadow banking sector, as neglecting the needed changes can lead to a trade-off between short term growth for a long-term financial sector that is not able to respond to the country's needs (Lu et al., 2015). But, is China doing enough to prepare itself to regional and global economic challenges? This is a key question that needs to be answered.

Firstly, China needs to push reforms that minimise the role of the state-owned banks that have historically acted as a conduit to channel financial capital into government run projects that are heavily represented by state-owned enterprises (SOEs) and where the Chinese government should reduce its market intervention and create incentives that facilitate free-market forces to identify the efficient allocation of capital.

China's banking industry is concentrated around the "Big Four" that are responsible for almost 50 to 60 percent of all China's loans. As such, the banking sector is shaped around an oligopoly that creates significant market distortions as it does not allow for competition between foreign and domestic banks as the sector remains privately owned.

The efficiency and effectiveness of the banking industry is significantly obstructed, as less profitable banks are blooming by issuing loans to uncompetitive and poorly managed SOEs that end up harming the country's economic potential.

Interest rates are also an area of concern, as China's central bank – the People's Bank of China (PBOC) - exercises continuous control on interest rates. While some efforts have been made to relax interest rate restrictions, such as having variable interest rates for deposits, full interest rate liberalisation remains a dream objective to be achieved.

Moody's estimates of China's shadow banking industry is around \$8.5trillion, raising serious concerns, as this unregulated activity could lead to a financial meltdown if a loan default or a third party must suddenly come up with money to guarantee debts.

Chinese policy makers are aware of the problems and risks associated with shadow banking, as recognised by President Xi Jinping in October 2013: "*... we are soberly aware of potential problems and challenges from falling demand, overcapacity, local debts and shadow banking, and we are paying close attention to possible impacts coming from the outside.*" Authorities have taken some steps in the right direction, for example, President Xi Jinping appointed Guo Shuqing as CBRC chairman in 2016, a highly regarded technocrat that has been quite aggressive by instituting new rules and regulations in the country's banking industry. The China Banking Regulator Commission is trying to place controls and develop regulations on shadow banking, that try to determine if banks have been using shadow banking products in order to cover up loans to money-losing "*zombie firms*" or businesses in government restricted industries (Hsu, 2016; Lu et al., 2015; Tan, 2014). Stricter lending standards have been introduced, monthly lending ceilings are imposed as also disclosure requirements regarding off-balance sheet assets, but are the introduced changes enough? Some analysts consider that China's biggest challenge to keep growing at sustainable rates are significantly tied to the country's banking system and the introduction of policies that help liberalise the sector in a context where the central government keeps insisting

on maintaining an authoritarian control on top banks leads to some suspicion. The oligopolistic structure of the banking sector contributes to enhance market distortions and does not allow for open competition from private banks. As the Big Four control about half the loans in the country, there is a dominance of the State on the banking sector that leads to less profitable and efficient activities in the country (Jiang et al., 2013; Wong and Wong, 2001). China's banking sector has important elements in place, such as for example: the mechanisms to carry out monetary policy are well developed, and many interest rates controls have been lifted. Monetary policy is smoothly carried out by the central bank through quantitative measures such as required reserve ratios, opening market operations, central bank lending and rediscount mechanism and to some extent through the price mechanism and through administrative policies. The findings by Fernald et al., (2014) indicate that China's monetary policy transmission channels, particularly interest rates, are moving closer to those of Western economies. On the other hand, changes seeking to improve price-based monetary policy are needed, as the creation of short-term interest rates to guide expectations. There are over 3,500 banking institutions outside the Big Four within China's financial system, including, policy banks, joint-stock commercial banks, city commercial banks, rural commercial banks, rural cooperative banks, rural credit cooperatives, village and township banks, foreign banks, and others. Around 120 types of interest rates were reformed between 1996 and 2007 signalling clear efforts to update and modernise the structure and functioning of China's financial system (Huang et al., 2013; Hsu, 2016).

Chinese Banking System Weaknesses

China's banking system was able to survive the international financial crisis; however, the introduced reforms do not seem to be sufficient to deal with the challenges of globalisation and with very competitive markets, as there is a strong continuation of excessive control and intervention that, when combined with weak corporate governance, highlights significant challenges ahead. Public ownership is hindering the establishment and development of a commercially driven financial system as banks continue to be used to pursue broader policy goals. While important efforts have been made to introduce regulation to the financial system and to improve corporate governance, enforcement remains a major area of concern, due to the lack of independence of bank managers and regulators and to the continuous intervention of China's government. Solvency problems are an area of concern as commercial banks are exposed to solvency problems due to public interference exercised by central and local governments that are not willing to abandon rooted practices of using banks as powerful policy tools that help to exercise control over the economy. Furthermore, competition remains low, as the Big Four enjoy an oligopoly position limiting the scope for competition, an aspect that the government is not willing to address and that can be a central part of the Chinese *sui generis* model. A banking system with a high degree of intervention, tight control over interest rates, credit quotas, licenses and a small opening for foreign banks does not offer an appropriate

environment that encourages competition or efficiency. At the same time, the growth of the shadow banking system is adding pressures on the need of further reforms that reduce financial repression and look to open up the banking sector due to the fact that an informal, largely unregulated, financial market has become increasingly risky as it can threaten the viability of the financial system (Lu et al., 2015). The traditional banking system in China has nurtured the development of shadow banking due to a credit regulatory policy that put severe restrictions on the ability of firms to obtain capital that, as a result, has prompted significant growth of the shadow banking system. Financial underdevelopment and financial repression have distorted saving and investment decisions affecting China's macroeconomic imbalances, aspects that need to be considered by the central government due to its global market economy aspirations. Government-induced distortions in the banking system impact negatively on financial development and undermine economic growth. Financial opening and deregulation are desirable features of a mature financial system, but the liberalisation process is associated with significant costs like the increase of market uncertainty, increased levels of competition, practices that seek to evade prudent regulations and the potential occurrence of a lending boom that can lead towards the creation of systemic vulnerabilities that would end up creating financial stress and ultimately, crises (Martin, 2012; Huang et al., 2013; Claessens et al, 1998).

Data and Methodology

Data Insights

Barker et al., (2012a, 2016) developed an index to measure economic policy uncertainty that is known as the EPUi. The EPUi has been used in a significant number of studies over the past few years. Researchers are very keen to develop the analysis of economic and market uncertainty and its implications for the macro-economy, the development of economic, monetary and fiscal policies and the repercussions and spillover effects to major macroeconomic fundamentals. The EPU index is understood as a good indicator of economic risk, and as such, we considered suitable its integration as part of this study. The analysis of the Chinese banking system and the historical dominance of the "Big Four" helps understand if the Chinese banking system is exhibiting fragile features during times of remarkable distress. As such the VIX, the HSI VIX the Global EPUi, and China's EPUi indexes were selected as suitable proxies that help capture market and economic dynamics and implications for China's top banks in a context of two market models, Granger causality and Frequency Domain causality tests.

Our research sample is formed by: the "Big Four" indices that account for China's top listed banks in the Shanghai and Hong Kong stock exchanges; we use four proxies for market uncertainty (the Global index for Economic Policy Uncertainty, the Chinese Economic Policy Uncertainty index, the Hang Seng Volatility Index and the VIX). Monthly data was used because the Economic Policy Uncertainty index for China is only available on a monthly basis, so the study starts with the development of a market model supported by monthly data and it moves towards the analysis of

dynamic causality using daily data with those variables which there is some available information, as the VAR approach followed by the frequency domain model did not work with the limited number of observations due to the use of a monthly frequency. As such, the study required the development of staged modelling to ensure that we were able to capture the banks' dynamics over the period of study. The time period under study spans from July 2010 to June 2018 subject to data availability and sample consistency.

Table 1: “The Big Four”- Chinese State-Owned Banks

Four State Owned Banks The Big Four	Total Assets US\$bn 2017	Stock Exchange	Sectors of Operation
Bank of China (BoC)	3,037.34	Shanghai	Foreign exchange, foreign trade and the national economy
China Construction Bank (CCB)	3,451.90	Hong Kong	Construction sector
Agricultural Bank of China (ABC)	3,284.79	Shanghai	Rural Banking businesses
Industrial and Commercial Bank of China (ICBC)	4,0070.22	Shanghai	Commercial and industrial activities in urban areas

*Source: Thomson Reuters Annual Information (2018). Four of the world's top 5 largest banks are Chinese financial institutions

The Chinese banking system is characterised by a multi-tiered system that is the outcome of the economic reforms introduced in the late 1970s as discussed earlier. The system contains wholly state-owned policy banks, local banks, private commercial banks and a growing underground sub-system that right now is a serious area of concern for Chinese policy makers. Overall, the Chinese banking system is considered to be very inefficient, due to the significant level of intervention from the central government, as the “Big Four” allocate around 60 percent of total credit to State Owned Enterprises (Martin, 2012; Fabre, 2013). The selected research framework integrates a market model, an augmented market model, static and dynamic causality tests that seek to offer robust outcomes regarding Chinese banks and their exposure to market, global and domestic uncertainty. The modelling process is summarised as follows: i) First, the data is transformed into returns (equation1) and realised volatilities are also estimated (equation3). ii) Afterwards, we identified the market models that would help capture the performance of the “*Big Four*” in the context of market uncertainty as outlined in equation 4 and 5 below. iii) The final part of the study is focused on the analysis of causal relationships between the “Big Four” and the selected proxies to capture for market uncertainty.

Market Model

Realised volatility is considered in the context of this study to gain an initial

understanding of the “Big Four” behaviour over the period under study (see appendix figure 4)

$$r_t = \ln(P_t) - \ln(P_{t-1}) \quad (1)$$

$$RV_t = \sum_{i=1}^n r_i^2 \quad (2)$$

$$RVol_t = \sqrt{RV_t} \quad (3)$$

The estimated market model is outlined below:

$$R_{it} = \beta_0 + \beta_1 R_{it-1} + \beta_2 R_{mt} + \beta_3 VIX_{it-1} + \beta_4 ChinaEPU_{it-1} + \beta_5 GlobalEpu_{it-1} + \varepsilon_{it} \quad (4)$$

where:

R_{it} = “Big Four” returns with $i = ABC, BOC, CCB, ICBC$.

R_{it-1} = “Big Four” returns lagged one period as per the outcome of the estimated VAR model

R_{mt} = market return (Shanghai Composite Se Index).

VIX_{it-1} = CBOE Implied Volatility Index; variable lagged one period as per the outcome of the estimated VAR model.

$ChinaEPU_{it-1}$ = Economic Policy Uncertainty Index for China.

$GlobalEPU_{it-1}$ = Global Economic Policy Uncertainty Index.

the Proxy variable would be equal to Global EPU_i, VIX and China's EPU_i and R_m for market risk measured by the Shanghai Stock Exchange.

Augmented Market Model

The market model (equation 4) is augmented to integrate the HSI VIX index that is a proxy to capture regional market uncertainty, as the HSI Volatility index tracks expected volatility of the Hang Seng Index implicit in the prices of the Hang Seng Options. The market model is then adjusted as follows:

$$R_{it} = \beta_0 + \beta_1 R_{it-1} + \beta_2 R_{mt} + \beta_3 VIX_{it-1} + \beta_4 ChinaEPU_{it-1} + \beta_5 GlobalEPU_{it-1} + \beta_6 HSIVIX_{it-1} + \varepsilon_{it-1} \quad (5)$$

The outlined market models help understand if the “Big Four” are sensitive to increased levels of market and economic uncertainty derived from the selected proxies. The China EPU_i and the Global EPU_i are introduced to measure the banks' reaction to economic and policy uncertainty with the aim of introducing a variable that measures domestic levels of uncertainty (China EPU_i) and global levels of market uncertainty (GLOBAL EPU_i); this will offer some insights with regard to the banks' level of openness to the global economy. For robustness purposes, the model is augmented to include the HSI VIX index that measures market uncertainty at the regional level. The next step in the modelling process involves the analysis of causal dynamics between the banks' performance and the selected proxies for regional and global uncertainty.

Granger Causality and Frequency Domain

Through the Granger causality and the frequency domain approach, we seek to examine frequency-varying causal effects across the banks under study with the aim of understanding how they are impacted upon by economic, equity and market uncertainty during the selected time period. The purpose is to identify the existence of a potential static and/or dynamic impact on the performance of the “*Big Four*” returns under a situation of market uncertainty that, in this case, would be measured by the selected proxies for uncertainty that are the VIX index (measuring a global impact) the HSI VIX index (measuring a domestic impact); and the Policy Uncertainty Variables for China (ChinaEPU) and the Global Context (Global EPU). The causality analysis is presented as a bivariate relationship that identifies the causal dynamics between the banks returns and the proxies for uncertainty, as outlined in the equation below:

$$R_{it} = \alpha_0 + \delta_{it}R_{it-1} + \gamma_{it}UProxy_{it-1} + \mu_{it} \quad (6)$$

where:

$UProxy_{it-1}$ = Uncertainty Proxy variable that integrates the four indexes capturing uncertainty in the context of bivariate causality modelling.

$$UProxy_{it-1} = VIX_{it-1}; HSI VIX_{it-1}; ChinaEPU_{it-1} \text{ and } GlobalEPU_{it-1};$$

In order to be able to estimate the frequency domain model, there was a need to use daily data, as the VAR estimation required a sufficient number of observations; this was however not possible in the case of the Economic Policy Uncertainty indexes since they are only monthly frequencies, limiting thereby the research sample to less than one hundred observations (95 observations in the context of this study); as a result, it was not possible to run an estimation including the Global EPUi and the China's EPUi as both indexes are available as monthly frequency with an outcome of 95 observations. As the main aim is to determine whether banks reacted differently to domestic or global uncertainty and to draw some connections regarding market volatility over the period under study and how they were impacted upon by episodes of remarkable market distress, the VIX and the HSI VIX indexes were considered appropriate proxies for regional and global uncertainty. A bivariate causality analysis between the selected banks and the proxies for market uncertainty is considered as part of the methodological framework with particular attention to causal effects running from the uncertainty indexes to the “*Big Four*” banks. A bivariate causality analysis in the context of the frequency domain brings further information to the indexes' behaviour over the sample period. The study by Breitung and Candelon (2006) is based on earlier work by Geweke (1982) and Hosoya (1991) that considered the two-dimensional vector containing with a finite-order VAR representative of order p ,

$$\Theta(L) \begin{pmatrix} Y_t \\ X_t \end{pmatrix} = \begin{pmatrix} \Theta_{11}(L) & \Theta_{12}(L) \\ \Theta_{21}(L) & \Theta_{22}(L) \end{pmatrix} \begin{pmatrix} Y_t \\ X_t \end{pmatrix} = \varepsilon_t \quad (6)$$

where, $\Theta(L) = I - \Theta_1 L - \dots - \Theta_p L^p$ is a 2×2 lag polynomial and $\Theta_1, \dots, \Theta_p$ are 2×2 autoregressive parameter matrices, with $L^k X_t = X_{t-k}$ and $L^k Y_t = Y_{t-k}$. The error vector ε_t represents white noise with zero mean and $E(\varepsilon_t \varepsilon_t') = \Sigma$, where Σ is positive and

finite. The MA representative of the system is

$$\begin{pmatrix} Y_t \\ X_t \end{pmatrix} = \psi(L) \eta_t = \begin{pmatrix} \psi_{11}(L) & \psi_{12}(L) \\ \psi_{21}(L) & \psi_{22}(L) \end{pmatrix} \begin{pmatrix} \eta_{1t} \\ \eta_{2t} \end{pmatrix} \quad (7)$$

with G being the lower triangular matrix of the Cholesky decomposition such that and The causality test developed by Geweke (1982) can then be written as:

$$M_{X \Rightarrow Y}(\gamma) = \log \left[1 + \frac{|\psi_{12}(e^{i\gamma})|^2}{|\psi_{11}(e^{i\gamma})|^2} \right] \quad (8)$$

Within this framework, no Granger causality from to with a frequency corresponds to the condition. Breitung and Candelon's (2006) main contribution is to show that this condition leads to

$$|\Theta_{12}(e^{-i\gamma})| = \left| \sum_{k=1}^p \Theta_{k,12} \cos(k\gamma) \right| - \left| i \sum_{k=1}^p \Theta_{k,12} \sin(k\gamma) \right| = 0 \quad (9)$$

where, $\Theta_{k,12}$ is the (1,2) element of Θ_k , such that a sufficient set of conditions for no causality is given by

$$\sum_{k=1}^p \Theta_{k,12} \cos(k\gamma) = 0 \text{ and } \sum_{k=1}^p \Theta_{k,12} \sin(k\gamma) = 0, \quad (10)$$

Hence, we can test the null hypothesis of no Granger causality with a frequency γ using a standard F-test for the linear restrictions imposed by the VAR representative of order p, which follows an F(2, T-2p) distribution for every γ between 0 and π , where T is the number of observations in the series (Breitung and Candelon, 2006).

Research Framework Justification

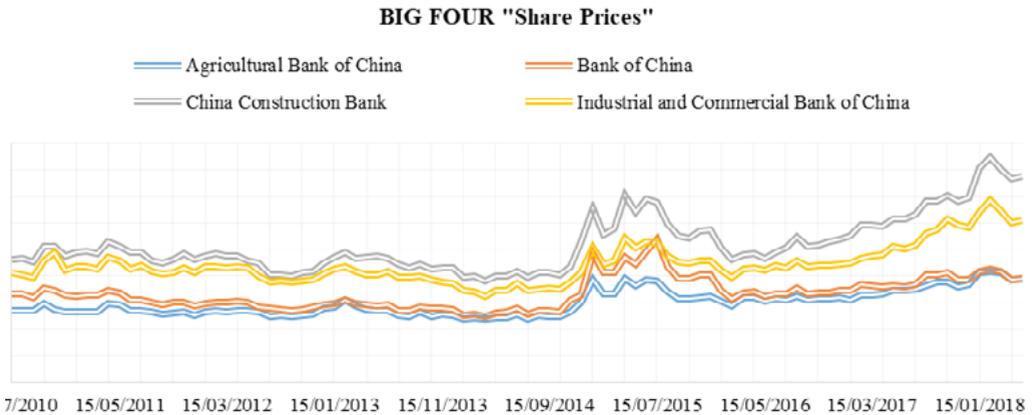
The implementation of a combined research framework supported by market models and causal tests offered a rich analysis to understand China's main banks performance in the context of regional and global uncertainty. The frequency domain causality test was selected because it is a dynamic test that can measure how the relationship between variables changes over the period under study and enrich the estimation from traditional static causal tests by bringing a dynamic approach to the study. Furthermore, as the study is analysing stability patterns exhibited by the "Big Four" it is important to consider if market uncertainty impacts on the performance of bank returns and if the relationship is dynamic, justifying the need of a close monitoring of banks behaviour as rising levels of market uncertainty can help policy makers to design and identify appropriate short-term policy measures that minimise potential negative spillover effects to the macroeconomic fundamentals so as to limit long-lasting effects in terms of market uncertainty.

Research Findings and Critical Insights

China's banking sector has experienced significant changes that have led to the deconstruction of the sector's functions, the need to address and resolve banks' major problems associated with non-performing loans, and the changes and continuous

transformation of the shareholding system that has settled the foundations to allow the sector to grow in strength and to start improving its international status (Min et al., 2018).

Figure 2: China Top Banks Share Prices



*Source: Thomson Reuters Annual Information (2018)

After the Global Financial Crisis, the Chinese economy was dealing with slow growth and entrenched deflation. Realised volatility (see figure 5 in the appendix) for the banks showed that late in 2014 and during 2015 the banks performance was characterised by high levels of market uncertainty that lasted for a few months. However, since late 2016, the performance of the Big Four shares reflect clear improvements in terms of market sentiment. The shares of the Industrial and Commercial Bank of China and of the China Construction bank (the nation's biggest lenders) rose to their highest levels in February 2018 setting a record high and offering initial signs of good macroeconomic performance, with analysts expecting "banking stock to be on the rise in 2018 amid a pickup of the Chinese economy" (South China Morning Post, 2018).

Table 2: Correlation Matrix

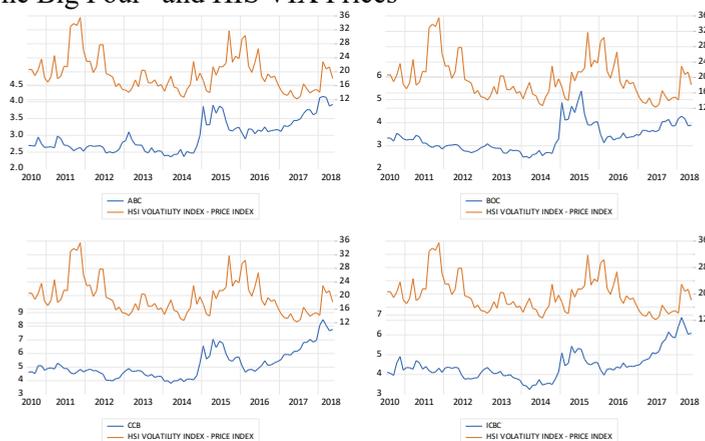
	ABC	BOC	CCB	ICBC	VIX	China_EPU _i	Global_EPU _i	HSI VIX
ABC	1.000000	0.899483	0.962161	0.918767	-0.294487	0.306871	0.167348	-0.130832
BOC		1.000000	0.857825	0.793973	-0.168055	0.180053	0.056518	-0.005840
CCB			1.000000	0.972655	-0.223161	0.250201	0.115737	-0.103419
ICBC				1.000000	-0.184442	0.236139	0.133727	-0.065402
VIX					1.000000	-0.047258	0.150476	0.735554
China_EPU _i						1.000000	0.880811	0.031548
Global_EPU _i							1.000000	0.206195

	ABC	BOC	CCB	ICBC	VIX	China_EPU _i	Global_EPU _i	HSI VIX
HSI VIX								1.000000

Research Sample: July 2010 to June 2018; data frequency: monthly data, number of observations: 95.

The correlation matrix above shows very interesting outcomes. As expected, there is a strong interlinkage between the “*Big Four*”, as correlations are positive ranging from 0.79 to 0.97 offering initial evidence of the strong connection that exists between the Big Four. However, the outcomes for market, domestic and global uncertainty are quite different. The correlations between the Big Four and the VIX are quite low and negative suggesting that the Big Four do not seem to be negatively affected by global market uncertainty. The outcomes for the HSI VIX align with patterns showed by the VIX, but in this case, correlations are slightly smaller (see figure 3 below for further insights). In the case of economic policy uncertainty in China, correlations are positive but quite low, a result that mirrors the outcomes for global economic policy uncertainty. However, it is worth to notice that the correlations for domestic uncertainty are higher than the ones registered for global uncertainty, suggesting that the banks are more impacted upon by economic and policy issues with a domestic origin rather than a global origin. The charts available in the Appendix (see figure 3) confirm the insights from the correlation matrix, as there is a clear positive correlation between the “*Big Four*” with lower connections detected between the banks and the proxies for market and economic uncertainty.

Figure 3: “The Big Four” and HIS VIX Prices



Before estimating the outlined market models (see equation three and four for details), basic time series tests were run to ensure that the econometric framework was properly developed. The analysis started with the estimation of a VAR model that allowed selecting the optimal number of lags to be used on the market model (the VAR suggested one lag). The ADF test was implemented to ensure stationarity properties of the series under study, and the multivariate cointegration test – Johansen and Juselius

– was estimated (there was no evidence of a long relationship between the “*Big Four*” and the proxies for market and economic policy uncertainty) to ensure that the static and dynamic Causality tests were properly defined. The outcomes for the market model are presented in table three below.

Table 3: Market Model Estimation

“Big Four”	β_0	β_1	β_2	β_3	β_4	β_5
ABC	0.004 (0.4097)	-0.252 (0.0110)**	0.430 (0.000)*	-0.0183 (0.4586)	0.001 (0.9360)	-0.0318 (0.3493)
BOC	0.0012 (0.8481)	-0.2110 (0.0322)**	0.500 (0.000)*	-0.0096 (0.7531)	0.0135 (0.4223)	-0.0616 (0.1431)
CCB	0.005 (0.3256)	-0.1666 (0.0956)***	0.4904 (0.000)*	-0.02811 (0.2873)	0.0096 (0.510)	-0.0566 (0.1191)
ICBC	0.004 (0.3794)	-0.239 (0.0142)**	0.4526 (0.000)*	-0.022 (0.3696)	0.0053 (0.6937)	-0.043 (0.1973)

*** 10% significant level, ** 5% significant level, * 1% significant level; p-values are presented in brackets. The market model was augmented to include the HSI Index to ensure robustness of outcomes (see table 5 below). Research Sample: July 2010 to June 2018; data frequency: monthly data, number of observations: 95.

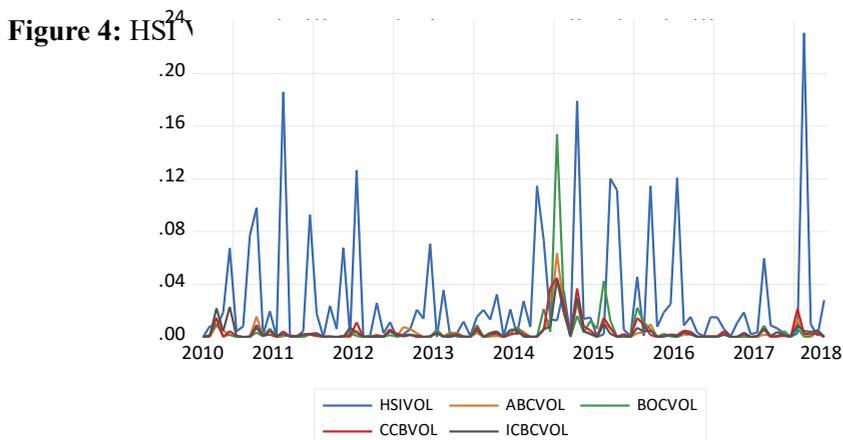
The market model shows that overall, the “*Big Four*” lagged value explains the behaviour of bank returns over the period having a negative impact on returns performance, with weak evidence reported in the case of the CCB (10% level of significance). Regarding market performance, the banks underperform the Shanghai Composite Se with beta coefficients ranging from 0.43 to 0.50, indicating that the banks are quite conservative and risks levels associated with the banks are below expected market levels. The outcomes for the proxies for market and economic policy uncertainty showed that the “*Big Four*” do not seem to be exposed to market uncertainty levels rising in the domestic and global markets. The outcomes for the augmented market model (see table 4 below) are in line with the results for the market model (equation 3), confirming the importance of lagged prices to explain market prices behaviour. The *Big Four* could be considered as exhibiting conservative patterns when compared to market performance with beta coefficients () exhibiting values quite below one, and smaller than the ones estimated by the market model with the exception of BOC that is slightly higher.

Table 4: Augmented Market Model including HSI VIX Index

“Big Four”	β_0	β_1	β_2	β_3	β_4	β_5	β_6
ABC	-0.0007 (0.8667)	-0.3336 (0.0000)*	0.3654 (0.000)*	-0.0147 (0.5108)	-0.0152 (0.6346)	-0.0108 (0.3735)	-0.0236 (0.4491)

“Big Four”	β_0	β_1	β_2	β_3	β_4	β_5	β_6
BOC	-0.003 (0.4216)	-0.3142 (0.0000)*	0.5326 (0.0000)*	-0.0352 (0.2727)	-0.0106 (0.3857)	-0.0106 (0.3857)	-0.0304 (0.3336)
CCB	0.000 (0.9199)	-0.1622 (0.0481)**	0.3627 (0.0000)*	-0.0080 (0.7200)	-0.0458 (0.1499)	0.0031 (0.7943)	-0.0500 (0.1096)
ICBC	0.0000 (0.9909)	-0.2300 (0.0139)**	0.3714 (0.0000)*	-0.01387 (0.5719)	-0.03737 (0.2859)	-0.0014 (0.7059)	-0.0129 (0.7059)

*** 10% significant level, ** 5% significant level, * 1% significant level; p-values are presented in brackets. The market model was augmented to include the HSI Index as follows: (the outcomes of the model did not changed the initial model results in a significant manner, showing consistency on results confirming the insignificant impact of proxies for market and economic uncertainty on the performance of the Big Four). Research Sample: July 2010 to June 2018; data frequency: monthly data, number of observations: 95



The outcomes from the causality analysis offer conflicting results (see table 5 below). The Granger causality test did not find evidence of causal effects from the proxies for market and economic policy uncertainty towards the “Big Four”. On the other hand, the results from the frequency domain offer evidence of bidirectional causality that are linked to registered episodes of increased market volatility with no evidence of causal effects when the volatility levels are considered at “normal” levels (see figure 4 above and 7 in the appendix). These results are pointing to the need of short-term monitoring of banks performance, with domestic and regional events appearing to have a stronger impact on the Chinese banking system rather than any global exposure, as dynamic causal effects were relatively limited when compared to domestic uncertainty with a more dynamic behaviour identified.

Table 5: Causality

"Big Four"	Granger Causality				Frequency Domain	
	VIX	ChinaEPUi	GlobalEPUi	HSI VIX	VIX	HSI VIX
ABC	No	No	No	No	↔*	↔*
BOC	No	No	No	No	↔*	↔*
CCB	←***	←***	No	No	↔*	↔*
ICBC	No	No	No	No	↔*	↔*

*The Granger causality test offers weak evidence on unidirectional causality running from the VIX and the China EPUi to CCB with p-values at ten percent level (the test was performed on calculated returns). Research Sample: 16th July 2010 to 8th June 2018; data frequency: monthly data, number of observations: 95 for Granger Causality. In the Case of the Frequency Domain Research Sample: 16th July 2010 to 8th June 2018; data frequency: daily data, number of observations: 2061.

Critical Insights

The Chinese authorities have introduced significant reforms to the country's banking system with the aim of improving banks in terms of size and capital. However, despite all the efforts and implemented measures, there is still a need of further work, as the asset quality, business profitability and diversification of services are not well-developed, and as they are considered to be quite far from international standards (Paulet and Relano, 2018). Researchers question the capacity of the Chinese banking system and its ability to support and promote sustainable growth and to deal with international demands. Hou, Wang and Zhang (2014) argue that the Chinese banking system appears to be surrounded by more uncertainty than ever. Dobson and Kashyap (2006) go a step further by identifying conflicting goals as part of the reform process, as authorities seek to accomplish incompatible objectives in a simultaneous manner. Government authorities are safeguarding their ownership and control of banks, as they are considered as key tools to implement the government social-driven policies, and at the same time they are looking to achieve greater levels of efficiency. This contradiction is considered as one of the biggest originalities of the Chinese financial system, that despite four decades of successive reforms, the government still preserves a strong influence on the banking sector (Allen, Qian and Qian, 2007; Kobil and Dow, 2013). A significant number of research studies examining the efficiency of the banking sector seem to converge towards the view that privatisation, deregulation and the presence of foreign banks are generally associated with improved performance and efficiency in the overall system (Heffernan and Fu 2008; Garcia-Herrero and Santabábara 2008; Laurenceson and Qin 2008; Ferri 2009; Fu and Heffernan 2009; Lin and Zhang 2009; Shen, Lu, and Wu 2009; Zhang and Daly 2011; Jiang, Yao, and Feng 2013; Xu and

Hu 2013; Dong et al. 2014; Foo and Witkowska 2014; Tan 2014, 2016). On the other hand, a very limited amount of studies seems to bring a different view, arguing that the results are still not entirely conclusive (Fu and Heffernan 2009; Lin and Zhang 2009; Shen, Lu, and Wu 2009). Paulet and Relano (2018) argue that China's banking system is increasingly shaped by Western standards and will most likely continue to be so in the near future. However, is this really the case? Chinese authorities seem to have a different understanding of the role of the banking system as they are moving quite ahead with their reforms and strict compliance with Basel III recommendations by establishing a system of prudential banking regulation that is stricter than international standards. This approach highlights the importance for Chinese authorities of keeping tight controls on their banking system, and this should be considered carefully as deregulated and liberalised banks can harm the macro-economy, as the painful lesson learnt from the GFC has taught; from China's perspective, this implies that the plans ahead for its banking and financial system might not be that closely connected to the model followed by the Western economies.

Conclusions

China's ability to keep growing and gaining in terms of efficiency is tightly connected with the development of its banking and financial system. Despite tremendous changes over a relatively short period of time, the country's capital markets remain underdeveloped when compared to other emerging economies in the East Asian region. China's financial deregulation and globalisation is affected by significant deficiencies in terms of credit culture and information transparency. The government's backing of SOEs borrowing has created moral hazard issues, as banks finance unviable projects because of the state's implicit insurance. Chinese banks are not able to offer proper support to the non-state sector; as a result, they are not capable of acting as the financial engine of the economy, since the banks are mainly a source of soft-lending to loss-making SOEs and since shadow banking is on the rise. China's banking system is clearly dominated by few large banks that are facing serious quality asset problems, a fragmented credit culture, a noisy information set, a weak regulatory framework with supervisory deficiencies that require further progress (Nazmi, 2006). An issue that needs to be questioned is how economies that have liberalised their financial system defending deregulation, market efficiency, innovation and global integration were badly affected by the GFC, while China with its closely monitored and interventionist financial system has managed to weather two major crises – the Asian Financial Crisis and the GFC. There is no doubt that market efficiency, innovation and competition are desirable features, but there is also a need of considering that the financial system requires some level of regulation and market intervention to ensure that systemic risk is under control. The key challenge for Chinese authorities is how to implement the needed reforms without creating disruptions and moving towards the implementation of a model that goes against the foundations of its economic model.

Finally, China's reform of its financial system can perhaps bring new aspects that might open the debate towards a different banking model that offers an alternative

to the existing western-dominated financial systems. This is a line of research that remains open as China keeps progressing with its ambitious reform strategy.

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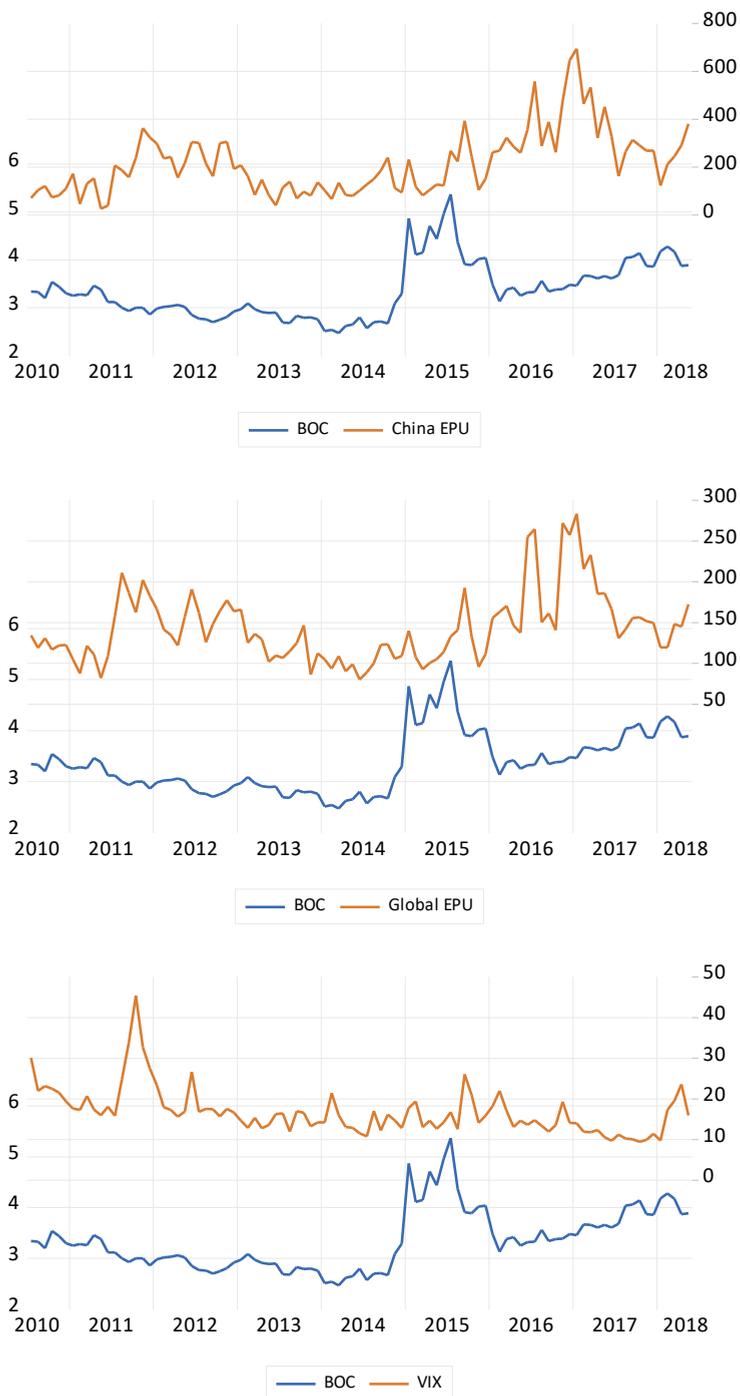
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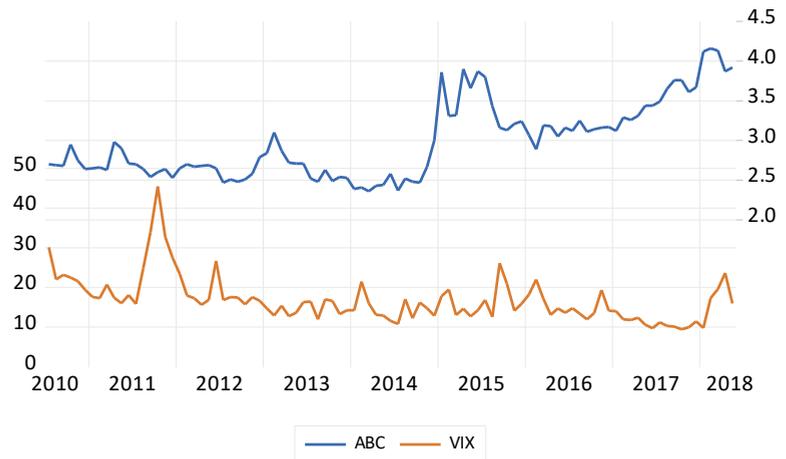
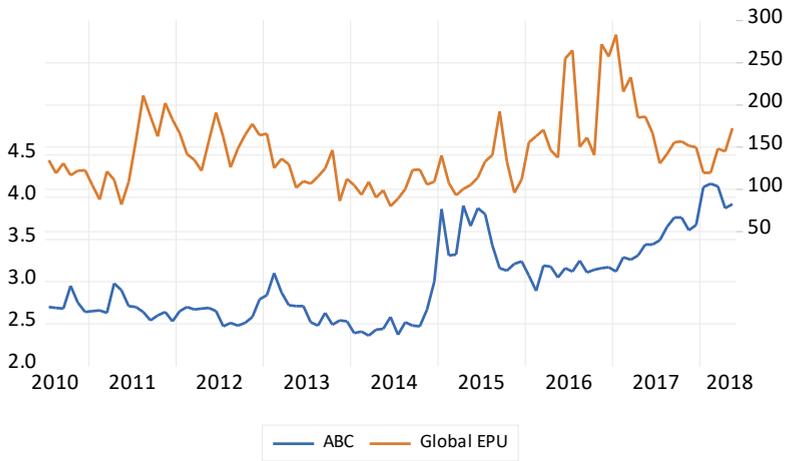
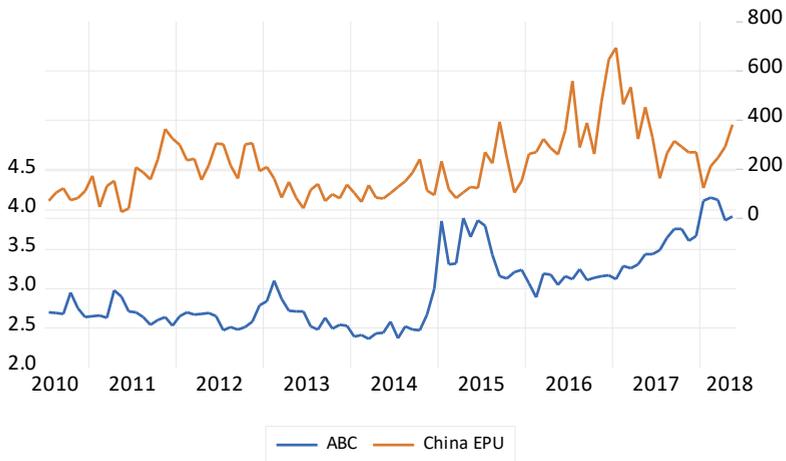
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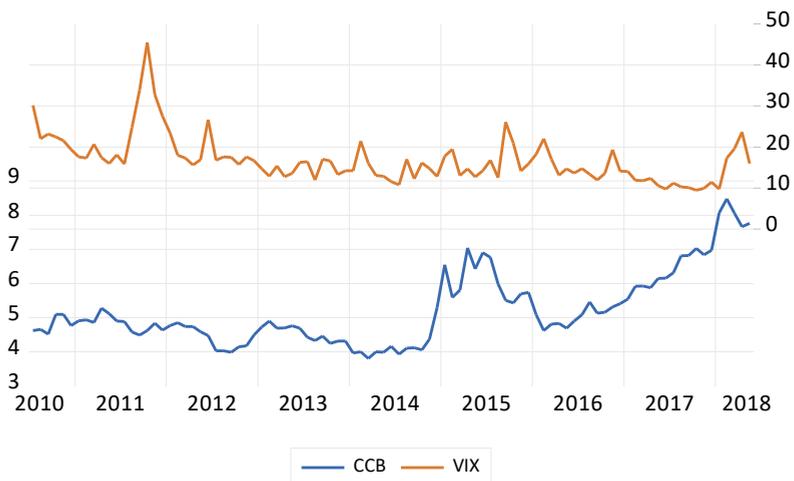
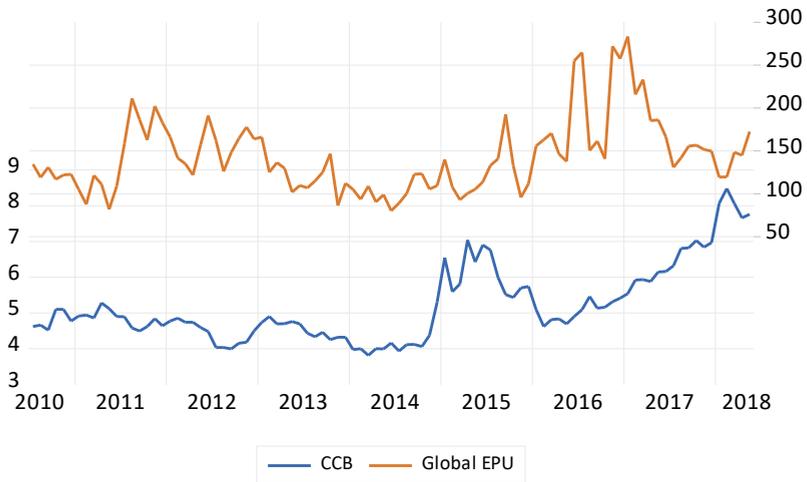
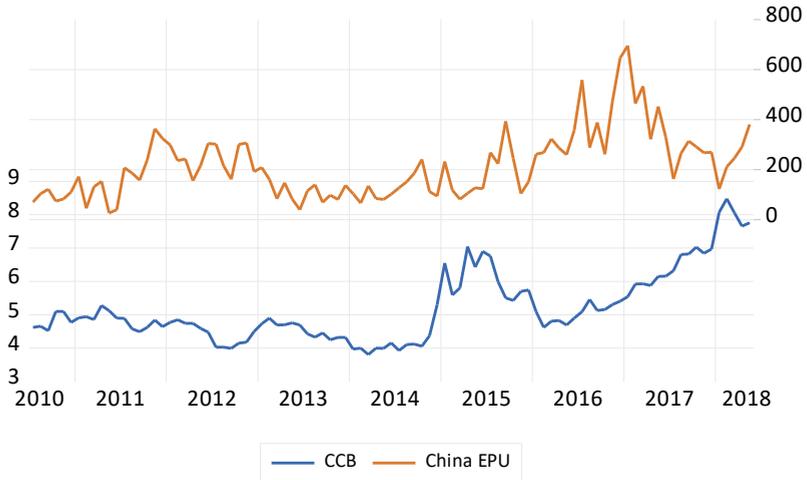
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Appendix

Figure 5: Big Four Prices and Proxies for Market Uncertainty Indexes







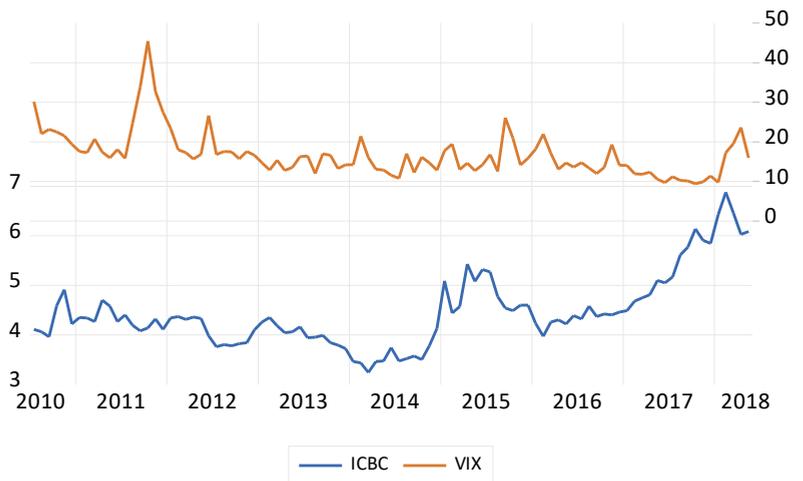
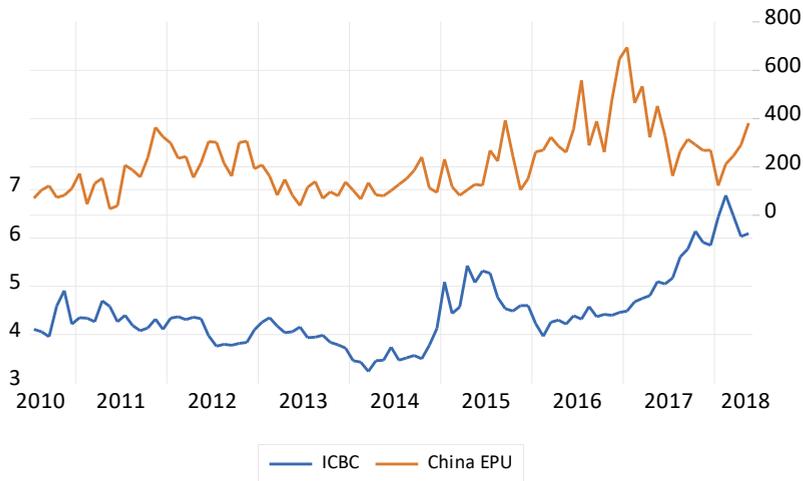
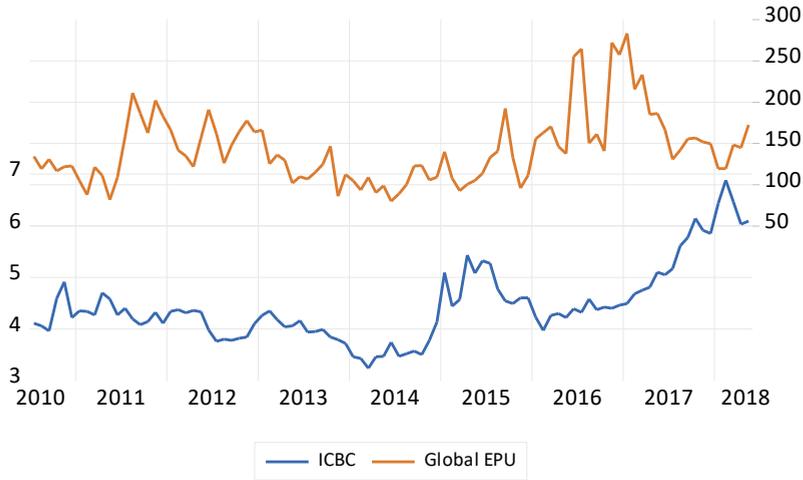


Figure 6: “Big Four” Realised Volatility

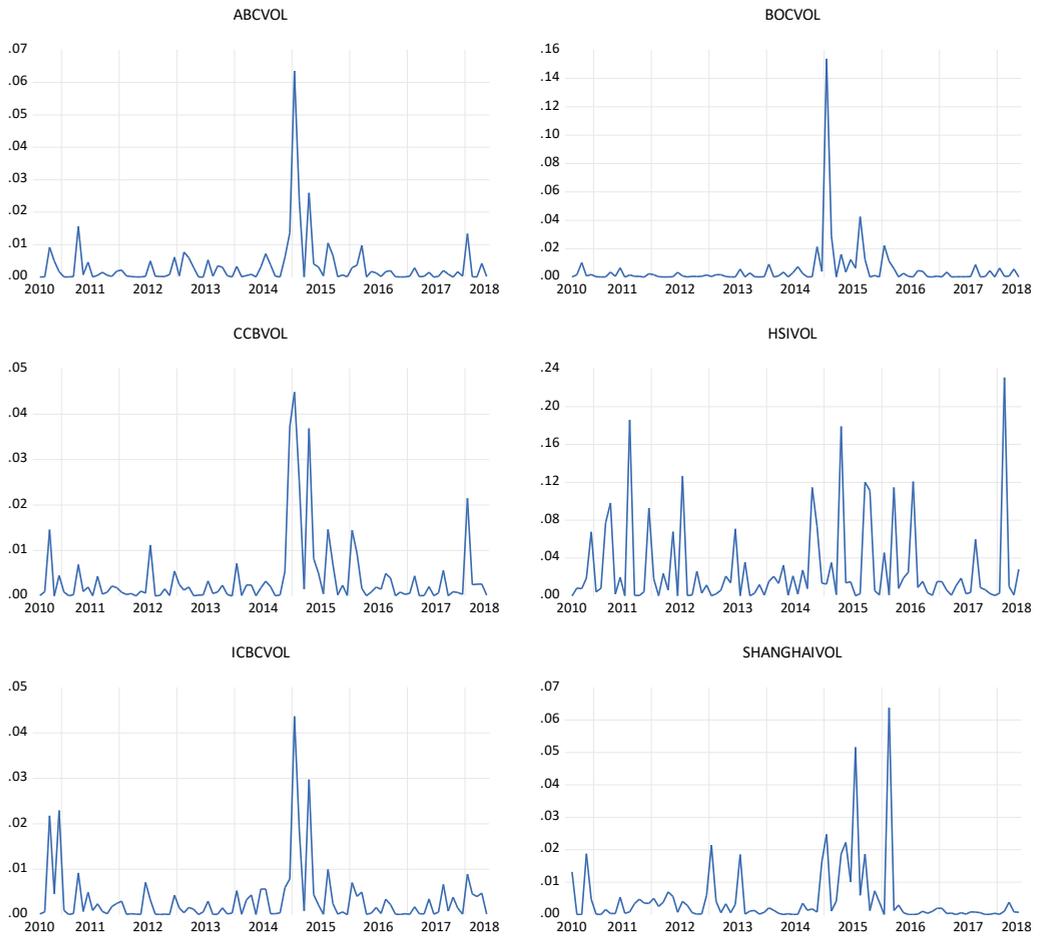


Figure 7: “Big Four” Frequency Domain Estimation Outcomes

