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Equity Capital Flows from the U.S. to China

Did Stock Connect make a difference?

Supervisor
Ch. Prof. Eric Girardin

Graduand
Omar Bortolato
Matriculation Number 861724

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To this tremendous journey called life
and to those who gave it to me

Ricordeve,
che se ghe a ga fata uno
che xe nato su un paese che se ciama Zero,
poe farghea chiunque

INTRODUCTION

During last 20 years, China's market reforms have made it easier to access mainland's equity markets for global investors and for domestic ones to invest in foreign stocks. On April 10, 2014, Premier Li Keqiang officially announced the Shanghai-Hong Kong Stock Connect program and on November 17, 2014, it was launched. On December 5, 2016, another Connect was implemented, the one that connects Shenzhen stock market to Hong Kong one. Stock Connect allows investors in mainland China, Hong Kong residents and foreign investors to trade eligible stocks listed on the other market, through the exchange and clearing houses in their home markets. With these Connects, mainland investors are eager to enter Hong Kong or even foreign stock markets, and foreign investors may explore new access to mainland China stock markets, which potentially means more foreign capital flowing into the Chinese equity markets, improving the liquidity of the stock markets itself.

This study aims to answer whether Stock Connects affected the equity capital flows between the U.S. and China, both mainland and the special administrative region of Hong Kong. Therefore, the study is separately conducted among these two different regions. Initially, we will apply the same model to both the territory, to understand if China (mainland) and Hong Kong present similarities before and/or after the implementation of the Connect. We will derive after a specific model for each country, to let us also appreciate the difference among the model, and to understand on what investors rely on when they have to invest in China rather than Hong Kong. Finally, the intent of this work is also to analyze whether the two stock Connects impacted in the same way the markets, or not.

Insofar, the research about the gradual opening up of the Chinese market has been really prolific. More specifically, several works have been written also about the effect of Connects, however, most of them analyze the impact on companies or more in general on the stock market it-self, and do not focus on equity flows. Some other research focus on the potential relationship and similarities between Hong Kong market and mainland's ones (e.g., Shanghai and Shenzhen markets), but once again they tend to focus on different market features than equity capital flows.

For both model, monthly variation in Net equity holding has been initially regressed on a lagged dependent variable (LDV), a currency rate (USD/CNY), three stock exchange indexes (SSEC, FTSE Hong Kong and S&P 500), two volatility indexes (VIX and HISV) and a proxy for Capital Control. Once the general models have been obtained, they will be simplified to get a more specific one for each

Country, namely China (mainland) and Hong Kong. Starting from these specific models, several tests has been conducted to see if they were stable during all the sample considered (June 2010 to December 2018) or if some structural changes occurred.

What it is found is that while the second Connect did not impact in any model, the Shanghai-Hong Kong Stock Connect had an impact both in China (mainland) Model as well as Hong Kong one. Not only, after its implementation, investors seem to use Hong Kong for different purpose than before, while they care less about restriction in Capital Control when they have to invest in China.

With respect to previous work, this study confirms that similarity and co-movements exist between mainland's markets and Hong Kong, as in *Wang, Tsai, and Lin (2016)*, although Beijing's capital control affects these markets differently because of their distinct characteristics (*Fu and Mercurio, 2021)*. What it certainly adds to previous literature, is an equity capital flows prospective instead of one focused on equity market returns.

This work begins with a review of the existing literature, where there will also be a focus on singularities of the China's equity markets. Then section 3 introduces all the data used and reasons behind the choice of the models. The section 4 is about results and their discussion both from a statistical perspective and economic one. Finally, everything is summed-up within the conclusion.

REVIEW OF LITERATURE

The latest wave of liberalization and opening of the Chinese financial system is just an additional way through which the firms can get financed and receive extra sources. The same stock market is just one further step within the development of that financial system. In fact, during 1990s the Chinese government felt it was necessary to avoid funding state-owned enterprises (SOEs) only through bank loans and subsidies, so it built up the current stock market. In other words, the government wanted to use the stock market to address the issue of SOEs' long-term financing (*Girardin and Liu, 2019)*. Differently said, the market is a political-economic instrument and not a common stock market. According to the westerners, equity gives the investor a right of ownership and a variable income, i.e. a dividend, however this is not the case in China. Here, investors do not have an actual ownership of the companies since they are not involved in their governance. Moreover, they usually receive no regular dividends, hence they care almost exclusively about speculation. On the other hand, firms use the stock market to get extra finance, being obliged only to the state, and not to minority shareholders. That said, it is not easy to grasp what equities actually stand for.

For long, the situation was even more complicated since foreign investors always had a limited access to A-share stocks. One of the first attempts to overcome this restriction occurred in December 2002, with the Qualified Foreign Institutional Investor (QFII) program. Thanks to this scheme, some overseas institutional investors had access to A-share stocks. However, getting QFII licenses was extremely onerous. In addition, there were restrictions also when domestic residents would buy overseas stocks. But, similarly to QFII, in May 2006 domestic institutional investors have been allowed to purchase foreign stocks under the Qualified Domestic Institutional Investor (QDII) program. These two programs together have raised the international profile of China's market and investors (*Girardin and Liu, 2019),* however they have a relatively small size and only focus on institutional investors. Things have changed with Shanghai-Hong Kong, and Shenzhen-Hong Kong Stock Connect. These larger schemes include both institutional and retail investors and are active in parallel with the earlier QDII and QFII programs. Additionally, they bring more freedom, larger quotas, and lower transaction costs. Under Connects investors from China (mainland) can purchase selected Hong Kong and Chinese companies listed in Hong Kong, and at the same time, foreigners can buy China A-shares listed in the mainland. Since the programs is extend just to some firms, and not to the entire stock market, some companies are still protected by government capital controls. In Table 1 there are all the different steps occurred within the implementation of the two Connects.

Table 1 - Steps of Connects (source: SSE website)

Date	Event
2012/12	First meeting between SSE and HKEX
2014/4	Premier Li Keqiang announced the SH-HK Stock Connect
2014/9	SSE published relevant rules
2014/11/17	The SH-HK Stock Connect launched
2016/8	Aggregate quota abolished
2016/12/05	The SZ-HK Stock Connect launched
2018/5	Daily quota increased by 4 times
2018/9	The Northbound Investor ID Model officially launched
2018/1	Front-end controls for northbound trading went online

About capital control, *Yang Liu (2020)*, using 220 regulations, calculates a monthly capital control intensity index of China from December 1995 to December 2018. Generally speaking, the degree of capital control is a sign of how open a country's capital account is and the degree of freedom of capital flow. Although cross-border capital flows increase the domestic economic development, they also embed potential risks to the domestic financial system. Anyhow, focusing on the growth of its economy and financial market, China (mainland) gradually liberalized international capital flows. Among other things, this can also lead to a greater stability of the domestic economy, even if capital controls were significantly strengthened both in 1997 and 2008 when the crisis occurred (*Liu, 2020).*

Discussing about the effect of Connects, several works have been written, but most of them focused on the impact on companies or more in general on the stock market it-self. *Ma, Rogers and Zhou, (2021)* for instance documented both short-run benefits for companies as well as long-run exposure of China markets to the global financial cycle. It emerged that after inclusion, firms in the Connect, are more sensitive to external shocks than those that were not included. This happens because companies included in these programs are less affected by inland capital restrictions, hence less protected. Not only, this effect increases even more for firms which get financed mostly through external channel, as explained in *Ma, Rogers and Zhou, (2021)*. This implies that despite strict overall capital regulations, drivers of Global Financial cycles (e.g. U.S. monetary policy shocks) have an important spillover effects. Nevertheless, the Chinese government’s capital management strategies are still successful in reducing negative spillovers. About that, capital controls have been proved to create a useful wall against external shocks (see *IMF, 2012, Jeanne, Subramanian, and Williamson, 2012, Rey, 2015, Miranda-Agrippino and Rey, 2020*). That said, Connect schemes have also had positive effects on adherent companies, among which a better stock price response, higher investment boom and lower financing costs.This means that overall, connected companies can hedge the negative consequences cited above.

The Hong Kong market has some relationship with the Shanghai and Shenzhen markets. *Wang, Tsai, and Lin (2016)* for instance discovered that Shanghai-Hong Kong Connect had an impact both on returns and volatility of mainland markets. More precisely, the implementation of the Shanghai-Hong Kong Connect impacts stock volatility, which affects returns, and returns of stock markets interact with each other. This suggests that the three markets transmitted, through their comovements, the effect deriving from the Connect scheme implementation. However, the policy affected in a different way each market due to their distinct characteristics, i.e. different investor structure, regulation requirements as well as entry thresholds. Overall, this not only indicates that Shanghai and Shenzhen financial systems integrate with the more internationalized Hong Kong ones, but this result suggests also the gradually stronger influence of Chinese policies on global finance markets (*Wang, Tsai, and Lin, 2016)*. Finally, several authors, consistently with what had been found before, discovered that the gradual opening up of the market increases correlations between Chinese and foreign markets (*Wang, Tsai and Liu, 2014; He et al., 2015; Luo and Schinckus, 2015; Luo and Ye, 2015).*

DATA AND METHODOLOGY

Within this work seven independent variables, and two dependent ones will be used. In particular, dependent variables come from rearrangement of the variables:

Gross Foreign Purchase and Sales of equity between the U.S. and China (mainland). The gross foreign purchase is the sum between all the U.S. corporation stocks and Chinese stocks purchased by China residents from U.S. residents, while the gross sales refer to all the U.S. corporation stocks and Chinese stocks sold by China residents to U.S. residents.

Gross Foreign Purchase and Sales of equity between the U.S. and Hong Kong. Similarly to the previous series, the gross foreign purchase is the sum between all the U.S. corporation stocks and Hong Kong stocks purchased by Hong Kong residents from U.S. residents, while the gross sales refer to all the U.S. corporation stocks and Hongkonger stocks sold by Hong Kong residents to U.S. residents.

Both the series have been downloaded from the U.S. department of the treasury - Treasury International Capital (TIC) system website. When displayed, they must be intended in Millions of US Dollar.

About independent variables they are manipulation of the following series:

USD/CNY exchange rate, since Chinese currency (Renminbi) is not pegged to U.S. Dollar anymore, so it may be that changes in this currency rate could affect the stock market.

Shanghai Composite (SSEC) index, used as proxy for Chinese stock market, since one of the three market that will be analyzed in this work is the Chinese one.

FTSE CHI Hong Kong (FTSEHK) index, used as proxy for Hong Kong stock market, one of the other two markets take into consideration in this study.

S&P 500 (S&P500) index, used as proxy for American stock market, which is the third and last one market considered in this research.

Cboe volatility (VIX) index, used as proxy for volatility and sentiment of U.S. stock market.

HIS Volatility (HSIV) index, used as proxy for volatility and sentiment of Hong Kong stock market. Both the volatility indexes have been introduced as potential explanatory variables since they are known to capture important features of the stock market, that the merely stock returns cannot usually provide.

Capital control index, used as a proxy of strength and extent of Chinese Government control in Chinese market as provided by *Yang Liu (2020)*. The degree of capital control is a sign of how open a country's capital account is and the degree of freedom of capital flows that enter and leave the country. This index, among other things takes into consideration several parameters about stock market, bond market, mutual investment securities as well as derivatives, commercial and financial credits.

Except for the Capital control index, all the other series come from Investing.com.

All the series have monthly frequency, and data have been selected at the end of the month. The time frame goes from 30th June 2010 to 31st August 2018.

Data begin in June 2010, since from this month onwards the Chinese currency Renminbi is not pegged anymore to the U.S. Dollar. In this way, all the series considered should not be influenced by changes in the exchange rate regime. Indeed, before this date, USD/CNY rate faced several changes, sometimes being pegged, others being under a "managed float" regime.

Data selection end in December 2018 because the Capital Control Index, provided by *Yang Liu (2020)*, has been computed up to that date. This restriction should not compromise too much this work, since data would have stopped anyway one year after, to avoid aftermath of covid19.

Once all the data are collected, they must be seasonally adjusted, in order to avoid misspecification in the model. Data have been adjusted through U.S. Census Bureau's X-13 seasonal adjustment tools. As described in *Findley, et al. (1998)*, the algorithm under this method, assumes that in a time series, each observation Y_t can be decomposed additively:

$$Y_t = T_t + S_t + I_t$$

or multiplicatively:

$$Y_t = T_t \times S_t \times I_t$$

Where T_t is the trend component, S_t is the seasonal component, and I_t is the random component. To produce a seasonally adjusted time series, the Census X-13 tool estimates all these components for each observation, then remove the seasonal component from the time series.

Except for Capital Control Index, all the other variables used in this work have been seasonally adjusted. The time frame is always the same 30th June 2010 to 31st December 2018, except for the Gross Foreign Purchase and Sales of equity between the U.S. and both China (mainland) and Hong

Kong. The reason for this need will be explain later when data handling will be discussed. For the moment suffice to say that observations for China (mainland) start at 31st August 1994, while observations for Hong Kong begin on 31st May 1978. In APPENDIX A are plotted all the series, included the seasonal adjusted ones, as well as the path of the seasonality for each variable. The variables in the APPENDIX A are called as follow: CH for Net equity holdings (Gross purchase – Gross sales, every month summed to the precedent observation) between the U.S. and China (mainland); HK for Net equity holdings between the U.S. and Hong Kong; All the other time series name are quite self-explicative; When referring to the seasonal adjusted series, "_sa" has been added to the name of the series.

Seasonality have been detected pretty much everywhere, but there is one remarkable thing. While all the series which will generate dependent variables show a steady and recurrent pattern; the two time series of Net equity flows still shows a periodic pattern but this time they vary in size during years. In general, this pattern seems to widen as time increase.

Data handling

Once that all the time series of interest have been adjusted for seasonality, next step is to make them stationary when needed. In next pages will be presented and justified all the changes that have been made to the cited-above series in order to allow then the implementation of an econometric model. All the final data, i.e. the variables used in this work are reported in APPENDIX B. For the sake of simplicity, let us start initially with the creation of the dependent variables. In order:

USD/CNY is an exchange rate, and within the period considered, it is a non-stationary variable, in fact, as illustrated in Table 2.1, we fail to reject the unit root test since all the p-value are above the threshold of even 10%. That is why before handling with it, it must be first differentiated, hence compute the log-return of the exchange rate itself. As Table 2.2 shows, once differentiated, the variable becomes stationary. Finally, every return has been multiplied by 100, in order to display it as percentage. In Figure 1 it is displayed the behave of the log-returns (multiplied by 100) of (seasonally adjusted) USD/CNY rate from June 2010 to December 2018. From now onwards, this variable will be referenced by $\Delta\ \mathrm{USD/CNY}$.

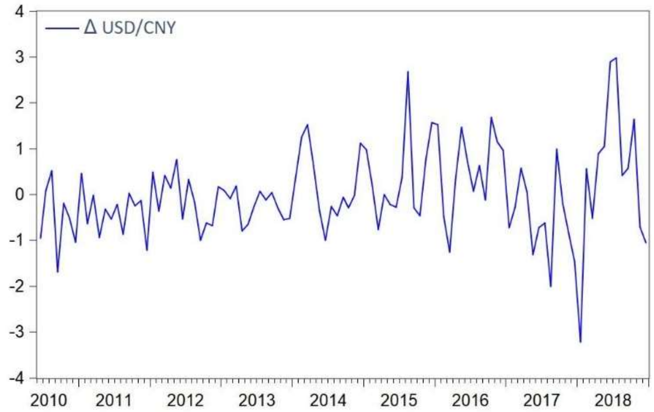


Figure 1 – Δ USD/CNY

As noticeable, even in Figure 1 the variable $\Delta\ USD/CNY$ is stationary. Note that it is more volatile in the second half of the plot. This is extremely interesting and something that must be take into consideration, since within this work everything aims to determine if there has been a change or not in the variables and model after the implementation of the stock Connect.

Similarly, also the SSEC index is nonstationary, in fact as displayed in Table 2.1 we fail to reject the null for all the tests conducted. For this reason, it must be first differentiated as well, and this led to stationarity (fifth column of Table 2.2). Also this time, every log-return has been multiplied by 100 and they were computed on the seasonal adjusted series. In Figure 2 are displayed the log-returns (multiplied by 100) of (seasonally adjusted) SSEC index from June 2010 to December 2018. From now onwards, this variable will be referenced by $\Delta\ SSEC$.

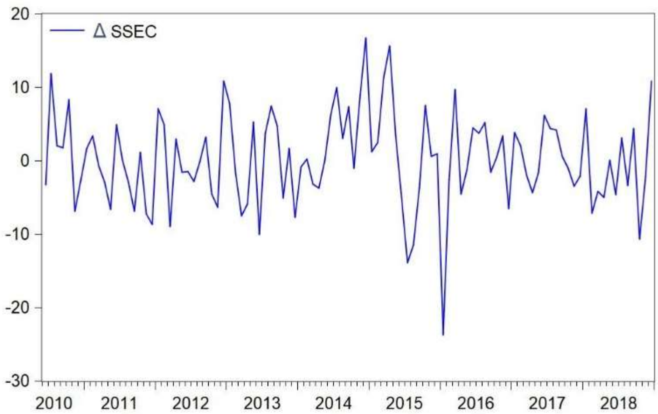


Figure 2 - Δ SSEC

Figure 2 displays a stationary variable, as it is confirmed in Table 2.2. From Figure 2 it is easy to notice how in June 2015 began what is known by "Turbulence of 2015-2016" (*Riley and Yan, 2015)*.

Also FTSEHK index must be first differentiated, since it is non-stationary at level (sixth column of Table 2.1). As before, every log-return has been multiplied by 100 and they were computed on the seasonal adjusted series. In Figure 3 are displayed the log-returns (multiplied by 100) of (seasonally adjusted) FTSEHK index from June 2010 to December 2018. From now onwards, this variable will be referenced by $\Delta\ FTSEHK$.

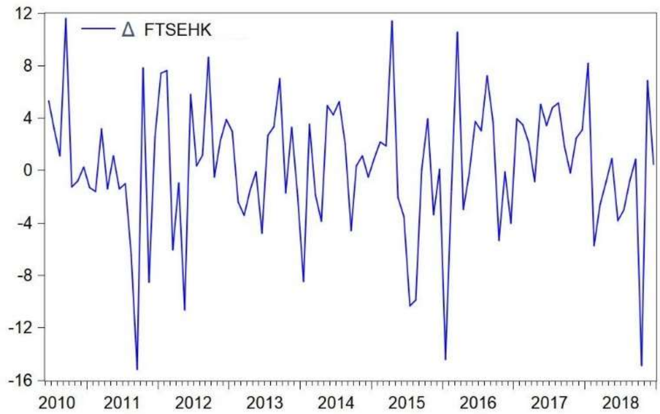


Figure 3 - Δ FTSEHK

From Figure 3, and from all the results of the stationarity tests conducted on this variable (Table 2.2) we can state that $\Delta\ FTSEHK$ is stationary. It is interesting to notice that, compared to $\Delta\ SSEC$ it is far less volatile. Indeed, where the former presents variations that roughly ranging from -16% to 12% (Figure 3), the latter swings between -25% and 15% (Figure 2). This is in accordance with what has been stated previously, namely the Chinese stock market is one of the most volatile (*Girardin, and Liu, 2019),* especially when it is compared with the more efficient western stock markets. And in a certain way, Hong Kong can be considered an international stock exchange as stated in *Garefalakis, et al. (2011)*.

Finally, also the last stock index within this work, the S&P 500, must be first differentiated before putting it into a regression, indeed as stated in Table 2.1 it is not stationary at levels. Once again, every log-return has been multiplied by 100 and they were computed on the seasonal adjusted series. In Figure 4 are displayed the log-returns (multiplied by 100) of (seasonally adjusted) S&P500

index from June 2010 to December 2018. From now onwards, this variable will be referenced by $\Delta\, SP500$.

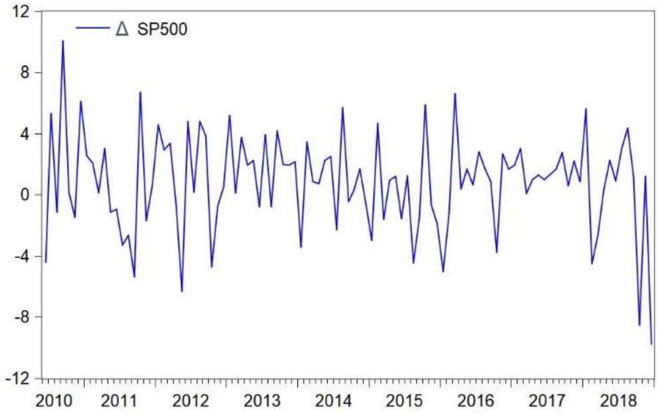


Figure 4 – Δ SP500

Table 2.2. confirm what Figure 4 suggests, the $\Delta\, SP500$ is stationary. Notice that, compared to previous two indices, it is even less volatile. Apparently, there are no significative breaks or change in the behaviors of this variable within the period considered.

Now it is time to consider the first of the two volatility indexes considered in this study: the VIX. As the eighth column of Table 2.1 shows this variable is non-stationary, hence it must be first differentiated. Once the unit root has been removed, the VIX becomes stationary (Table 2.2). Finally, the variable has been multiplied by 100 and it has been computed on the seasonal adjusted series. In Figure 5 are displayed the first differences (multiplied by 100) of (seasonally adjusted) VIX index from June 2010 to December 2018. From now onwards, this variable will be referenced by $\Delta\, VIX$.

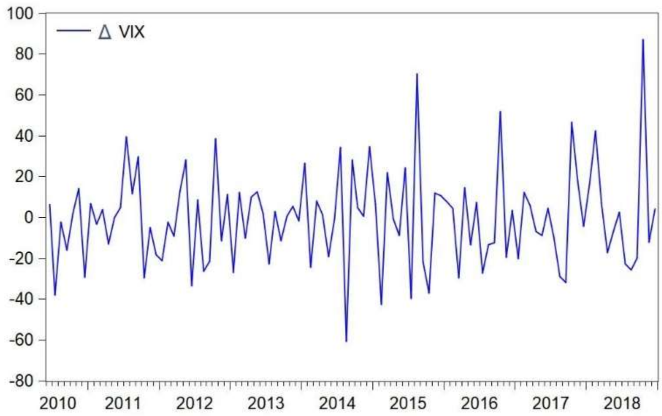


Figure 5 – Δ VIX

$\Delta\ VIX$ (Figure 5) is stationary as indicates also in Table 2.2, and it presents its most negative peak in August 2014, just three months before the implementation of the Shanghai – Hong Kong stock Connect.

About the HSIV, it must be differentiated as well, indeed we fail to reject the presence of a unit root (Table 2.1). The first differences have been multiplied by 100 and they were computed on the seasonal adjusted series. In Figure 6 are displayed the first differences (multiplied by 100) of (seasonally adjusted) HSIV index from June 2010 to December 2018. From now onwards, this variable will be referenced by $\Delta\ HSIV$.

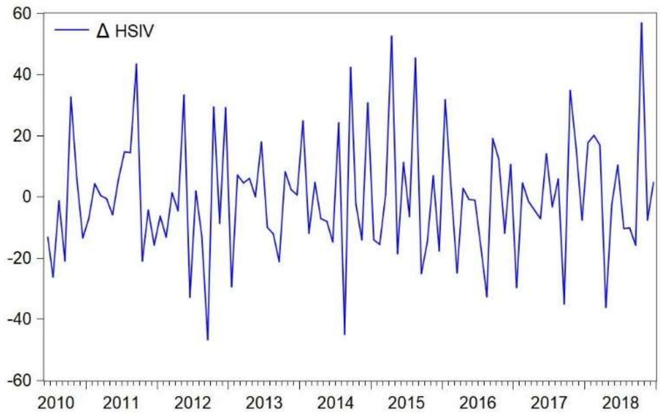


Figure 6 - Δ HSIV

$\Delta\ HSIV$ (Figure 6) is stationary, and the results of the relative unit root tests can be seen in second last column of Table 2.2. Compared to $\Delta\ VIX$ (Figure 5), it seems less volatile but its behavior is more homogeneous, while $\Delta\ VIX$ may display some volatility clusters. Finally, as $\Delta\ VIX$, also $\Delta\ HSIV$ presents a significant negative peak in August 2014. Notice that since both of them are volatility index, a negative peak basically means that volatility was at the minimum level, and the investors had a good sentiment on market.

Now it is time to discuss about the Capital Control Index. This variable will not be differentiated, but it will be used as it has been provided by its author *Yang Liu (2020)*. In his paper, Yang Liu refer to it as "Monthly Capital Control Intensity Index", so it is already quite self-explanatory. Anyway, it is an index that presents high values when the capital control exercised by the Chinese government is more intense. The milder the control, the lower the index. Within the period considered (June 2010 – December 2018), it ranges from 0.441 (in October 2017) to 0.684 (in June 2010). The only adjustment occurred in this variable is that it has been multiplied by 10, just to have the same order of magnitude of the other explanatory variables. From now onwards, this variable will be referenced by $CapContr$.

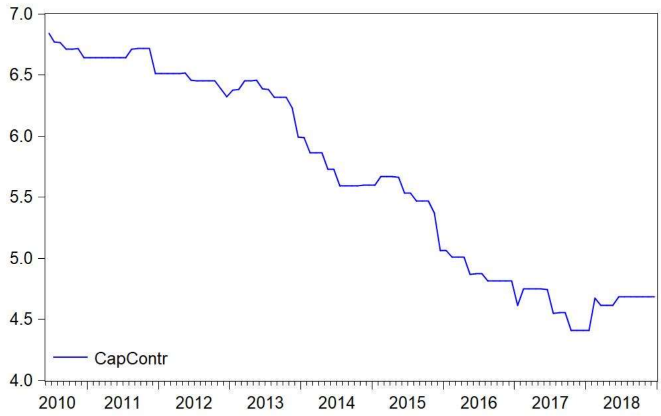


Figure 7 _ CapContr

$CapContr$ clearly displays a downward trend, meaning that on average, China markets are becoming less controlled by the government. Moreover, it is interesting to see how around the end of 2014, despite the implementation of the stock Connect, the index, thus the intensity of the capital control did not decrease, on the contrary it increased in February 2015, and this higher level of intensity lasted up to May 2015.

Now that all the independent variables have been introduced, it is time to explain the two dependent variables. The time frame that will be used in the model for these two variables is always the same: June 2010 to December 2018. However, to construct the variables, data was collected from 31st August 1994 for China (mainland), and from 31st May 1978 for Hong Kong. In order to have a better comprehension of the model, and a better interpretation of the dependent variables, it is useful to handling with the same kind of variables. So, if on the right-hand side of the equation there will be mostly returns or change in percentage, also on the left-hand side of the equation there should be a change in percentage or a return. That said, Net equity flows, namely Net inflows - Net outflows, do not fit for this kind of work. What will perfectly fit with this purpose is the change that has occurred each month in the Net holding of equity of each country. In other words, instead being a flow measure, the variable should be the monthly change of a stock quantity, hence the Net holdings of equity. To obtain these net holdings, since they are not directly available, it is sufficient to compute the cumulative Net flows since the very beginning, and then compute their monthly change. “Very beginning” means since when TIC system began to collect those data. The problem is that in TIC system website, especially at the beginning, not all months have a recorded, and this leads to a problem when applying the Census X-13 method to seasonally adjust the series, since this method does not allow negative or zero values. Due to all these reasons, as initial month, it has been selected the first month after which there would not be zero values anymore. This date is 31st August 1994 for flows between U.S. and China (mainland), while observations for Hong Kong begin on 31st May 1978. Once seasonally adjusted both the series, all the net flows were cumulated up to December 2018, but both the dependent variables start from June 2010, as all the others. Just for the sake of clarity, in May 2010 China had a Net holding of equity of $1,4 Billions, while Hong Kong had $ -28,3 Billions, namely Hong Kong held more U.S. equity than national one. From this month onwards, the variations in Net Holdings become the dependent variables used in this research (see APPENDIX B). From now onwards, these variables will be referenced by $\Delta NetCH$ for the variations in net equity holdings between U.S. and China (mainland) and $\Delta NetHK$ for the variations in net equity holdings between U.S. and Hong Kong.

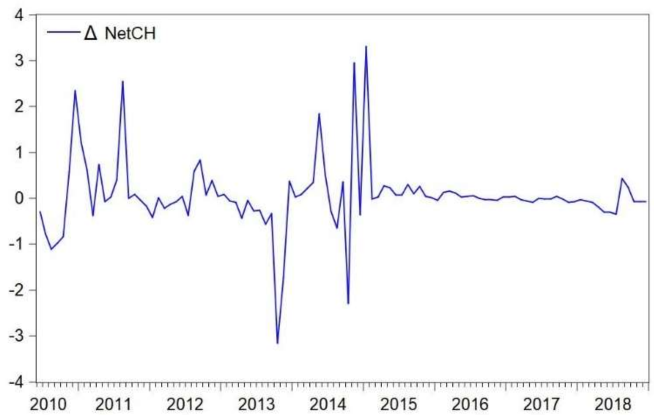


Figure 8 – Δ NetCH

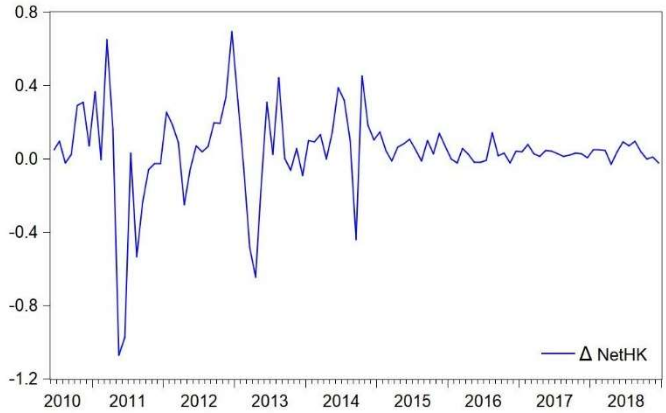


Figure 9 - Δ NetHK

Both $\Delta\ NetCH$ and $\Delta\ NetHK$ are stationary since we reject the presence of a unit root in all the test conducted (Table 2.2). Not only, both of them also seem to be quite volatile up to the beginning of 2015, while after this period the variations seem to be smaller. This could be really interesting since in this period the stock Connect was just implemented, meaning that its implementation may have had an impact on Net Holdings of equity, indeed Inflows and Outflows of equity.

To have the definitive proof to understand if the variables are stationary or nonstationary some tests have been conducted. In particular, each variable has been tested under the Augmented Dickey-Fuller test, as in *Dickey, and Fuller (1979)*, as well as under Philip-Perron test, see *Phillips, P.C.B. and P. Perron (1988)*. Just to avoid any kind of uncertainty about the results, both the tests were computed allowing for an intercept, an intercept together with a trend, or neither. What follows are the results of the tests conducted for all the variables take into consideration (Table 2.1) and their first differences (Table 2.2):

Table 2.1 - Results of stationarity tests

Test	NetCH	NetHK	USD/CNY	SSEC	FTSEHK	SP500	VIX	HSIV	CapContr
ADF_none	0.309	1.000	0.677	0.472	0.750	0.985	0.282	0.482	0.002
ADF_intercept	0.479	1.000	0.414	0.229	0.346	0.656	0.000	0.001	0.828
ADF_all	0.889	0.996	0.369	0.419	0.391	0.225	0.000	0.004	0.788
PP_none	0.301	1.000	0.699	0.558	0.748	0.993	0.133	0.455	0.002
PP_inter	0.517	1.000	0.517	0.308	0.346	0.653	0.000	0.001	0.828
PP_all	0.878	0.996	0.561	0.614	0.391	0.186	0.000	0.004	0.804

Table 2.2 - Results of stationarity tests conducted on differentiated variables

Test	Δ NetCH	Δ NetHK	Δ USD/CNY	Δ SSEC	Δ FTSEHK	Δ SP500	Δ VIX	Δ HSIV	CapContr
ADF_none	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
ADF_intercept	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.828
ADF_all	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.788
PP_none	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
PP_inter	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.828
PP_all	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.804

In both Table 2.1 ant Table 2.2 are reported all the p-values of the tests conducted. As might be expected all the variables, once differentiated are stationary, except $CapContr$ precisely because it has been taken at its levels. About this latter variable, the null hypothesis, thus the presence of unit root, can be rejected only when in the test are not included neither a constant, nor a constant together with a trend, but as seen in Figure 7, $CapContr$ seems to have both an intercept, as well as a trend. The following Table 3 reports the result of a LS regression of the variable $CapContr$ on a constant and a trend:

Table 3 - Results of the regression for CapContr

CapContr	Coeff. (t-stat)	p-value
Constant	7.032 (0.04)	0.00
Trend	-0.027 (0.00)	0.00

Since both the constant and the trend are highly significant, due to the results showed in Table 2.2 the variable $CapContr$ can be considered non-stationary.

Methodology

This work aims to find a model that can describe the monthly variations of Net equity holdings between U.S. and China (mainland), and between U.S. and Hong Kong. For this reason, there will be two equations to estimate. Both of them have the following structure:

$$\boldsymbol{y} = \boldsymbol{X}\,\boldsymbol{b} + \boldsymbol{e}$$

where $\boldsymbol{y}$ is the vector of fitted values, $\boldsymbol{X}$ is the matrix that contain all the independent variables, $\boldsymbol{b}$ is the vector that contains all the estimated coefficients of the regression, while $\boldsymbol{e}$ is the vector containing all the residuals of the regression. In other words, the vector $\boldsymbol{y}$ is a linear combination of all the other vectors and matrices just introduced. The method used to estimate the vector of coefficients $\boldsymbol{b}$, hence to obtain the fitted values $\boldsymbol{y}$ is the Least Squares (LS) method, which minimizes the sum-of-squared residuals for each equation (*Dinardo, and Johnston, 1997)*.

That said, one model will try to explain the variable $\Delta\ NetCH_t$ and the other one, the variable $\Delta\ NetHK_t$. On the other hand, within the matrix $\boldsymbol{X}$, there will be all, or just some of the independent variables listed before, all of them lagged by one month, and the dependent variable itself, always lagged by one month, namely: $\Delta\ NetCH_{t-1}$ or $\Delta\ NetHK_{t-1}$. All the other variables are $\Delta\,USD/CNY_{t-1}$, $\Delta\,SSEC_{t-1}$, $\Delta\,FTSEHK_{t-1}$, $\Delta\,SP500_{t-1}$, $\Delta\,VIX_{t-1}$, $\Delta\,HSIV_{t-1}$ and $CapContr_{t-1}$.

The reason why all the variables have been introduced lagged by one month is that when investors have to decide whether to purchase or sell a stock, it is likely that they rely on data available up to that moment, which in this case coincide with last previous month data. Moreover, it has been introduced also a lagged dependent variable (LDV), to avoid autocorrelational effects which could weaken accuracy of the model (*Keele and Kelly, 2006).*

Once a model will be obtained, next step is to look for potential structural changes in it, since the aim of this work is to assess, whether the stock Connects have caused a break in the model, or not. To find out potential break(s) several tests will be used, among which: Bai-Perron test for multiple breakpoints tests, as in *Bai and Perron (1998), and Bai and Perron (2003)*; and Chow test to test for breaks at a specific date. This test seeks to determine whether there are appreciable discrepancies in the estimated equations by fitting the equation separately for each subsample. A noticeable difference suggests that the relationship's structure has changed (*Chow, 1984)*.

If the model will present one or more structural break(s), it will be re-developed accordingly to take into account this change in its behavior and stabilize it. Once the framework will be stabilized, less significant variables will be dropped off by the equation. In this way, this research will try to end-up with a model which is the simpler as possible, without compromising its efficacy.

In addition, a residual diagnostic will be conducted. This last step is to ensure that residuals of the regressions will be: Normally distributed: this requirement is tested through a Jarque-Bera test, and by looking at the moments of the distribution; Non serially correlated: this feature is tested through a Lagrange Multiplier (LM) test, since it is applicable also when there are LDP in the equation; and Homoskedatic. This last residuals' characteristic is tested via the Breusch-Pagan-Godfrey test (Breusch and Pagan, 1979 and Godfrey, 1979) which is a LM test as well.

If all the above-mentioned characteristics exists, the final model can be considered accurate and significant.

RESULTS

Since within this work two main models are discussed, this section is divided in two parts as well, the first one refers to the equity holdings between U.S. and China (mainland), while the latter one is about holdings between the U.S. and Hong Kong.

Equity holdings between U.S. and China (mainland)

As a starting point, we try to keep the model that will be studied as general as possible. This is because every single variable may detect some features or behaves of the net equity holdings. In fact, as previously introduced all the potential explanatory variables are related to China, U.S. and Hong Kong markets, so it is reasonable to think that they may have some explanatory power. Within this sub-section the initial model is the one described in Eq. 1:

$$\Delta NetCH_t = b_0 + b_1\, X_1 + b_2\, X_2 + b_3\, X_3 + b_4\, X_4 + b_5\, X_5 + b_6\, X_6 + b_7\, X_7 + b_8\, X_8 + e \qquad (1)$$

Where X_i are the independent variables introduced before, respectively:

Variable name	$\Delta NetCH_{t-1}$	$\Delta \frac{USD}{CNY}_{t-1}$	$\Delta SSEC_{t-1}$	$\Delta FTSEHK_{t-1}$	$\Delta SP500_{t-1}$	ΔVIX_{t-1}	$\Delta HSIV_{t-1}$	$CapContr_{t-1}$
Variable number	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8

What follows (Table 4) are the results of the LS multiple regression conducted on Eq. 1:

Table 4 - Estimation of Eq. 1

Dep. Variable: $\Delta NetCH_t$	06/2010 - 12/2018						
	Coeff. (t-stat)	p-value					
Intercept	-0.044 (-0.07)	0.94					
$\Delta NetCH_{t-1}$	0.095 (0.92)	0.36					
$\Delta USD/CNY_{t-1}$	0.014 (0.14)	0.89					
$\Delta SSEC_{t-1}$	0.007 (0.4)	0.69			Mean	0.000	Residuals
$\Delta FTSEHK_{t-1}$	-0.009 (-0.33)	0.74	# Obs.	102	Skewness	0.786	
$\Delta SP500_{t-1}$	-0.02 (-0.45)	0.65	R^2	0.031	Kurtosis	10.206	
ΔVIX_{t-1}	0.001 (0.13)	0.90	Adj. R^2	-0.053	JB test	231	
$\Delta HSIV_{t-1}$	0 (0.05)	0.96	RSS	62.451	BG test	Serially Correlated	
$CapContr_{t-1}$	0.02 (0.19)	0.85	AIC	2.524	BPG test	Homoskedastic	

With this first attempt, the estimated coefficients of Eq. 1 are not significant, R^2 is low, and residuals are serially correlated. However, it makes sense to further investigate it, and looking if any structural change affects the model. By looking at $\Delta\ NetCH$ plot (Figure 8) it seems that the variable displays a different behavior after beginning of 2015, so if any break occurs, it should have happened within this period (end 2014 – begin 2015). However, since there are no sufficient proof for this time span, first of all it is better to conduct a multiple breakpoints test, too see how many, if any, breaks occurs and when. To get this information, a Bai-Perron test is enough since it allows for multiple unknown breakpoints. Due to the fact that in Eq. 1 there are a lot of parameters to estimate, we limit the trimming percentage at 20. The trimming percentage is a parameter which intervenes in the minimum segment length permitted when constructing a test. Since within our sample there are 102 observations, it means that regimes are restricted to have at least 20 observations. For the sake of completeness, 20 observations are definitely not sufficient to estimate 9 coefficients. Indeed, *Harrell (2001)* suggests a minimum EPP (events per predictor parameter) number of 10. Anyway, for this moment Eq. 1 just represent a starting point and not the final model. Moreover, an increase in trimming percentage corresponds to a decrease in potential number of break points, due to the trade-off between the maximum number of breaks and the sample size together with the trimming percentage.

The conducted Bai-Perron test suggests that the model have a break in November 2014, significant even at 1%. This date is truly interesting since November 2014 is the exact month in which the stock Connect between Shanghai and Hong Kong was implemented.

Anyway, to be even more certain, this result has been evaluated also with a Chow breakpoint test, using November 2014 as breakpoint date. Even under this test the break is significant at 1%. Unfortunately, since Eq. 1 includes an AR(1) process, it is not possible to further investigating for stability of the model through recursive estimates (e.g. CUSUM, CUSUM of squares, etc.). However, there is enough evidence to state that within Eq. 1 a break occurred in November 2014.

In order to stabilize the model, a dummy variable d will be added to Eq. 1. This dummy variable will take value of: 0 up to October 2014, and 1 from November 2014 onwards. Not only, in addition to this dummy, there will be added also all the products between the regressors and the dummy itself. In this way, during the estimation process, the model will take into account the structural change occurred in November 2014, by "re-computing" the coefficients after this date. The new equation is the following (Eq. 2):

$$\Delta NetCH_t = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + b_9 d + b_{10} d X_1 + b_{11} d X_2 + b_{12} d X_3 + b_{13} d X_4 + b_{14} d X_5 + b_{15} d X_6 + b_{16} d X_7 + b_{17} d X_8 + e \quad (2)$$

Where the regressor are the same of Eq. 1, and d is the dummy just introduced. Once again, the coefficients to estimate are definitely too much for a sample with 102 observations, but this is just the general model which will be relieve after. What follows (Table 5) are the results of the LS multiple regression conducted on the new Eq. 2:

Table 5 – Estimation of Eq. 2

Dep. Variable: $\Delta NetCH_t$	06/2010 - 12/2018				Residuals	
	Coeff. (t-stat)	p-value				
Intercept	-1.856 (-0.92)	0.36				
$\Delta NetCH_{t-1}$	0.41 (3.4)	0.00				
$\Delta USD/CNY_{t-1}$	0.259 (1.35)	0.18				
$\Delta SSEC_{t-1}$	-0.035 (-1.58)	0.12				
$\Delta FTSEHK_{t-1}$	0.013 (0.38)	0.70				
$\Delta SP500_{t-1}$	-0.016 (-0.29)	0.77				
ΔVIX_{t-1}	0.008 (0.73)	0.47				
$\Delta HSIV_{t-1}$	-0.006 (-0.56)	0.58				
$CapContr_{t-1}$	0.298 (0.95)	0.35				
d	-1.102 (-0.44)	0.66				
$d\ \Delta NetCH_{t-1}$	-0.893 (-4.63)	0.00				
$d\ \Delta USD/CNY_{t-1}$	-0.284 (-1.27)	0.21				
$d\ \Delta SSEC_{t-1}$	0.076 (2.16)	0.03			Mean	0.000
$d\ \Delta FTSEHK_{t-1}$	-0.046 (-0.81)	0.42	# Obs.	102	Skewness	-0.083
$d\ \Delta SP500_{t-1}$	0.009 (0.11)	0.91	R^2	0.321	Kurtosis	8.019
$d\ \Delta VIX_{t-1}$	-0.007 (-0.5)	0.62	Adj. R^2	0.184	JB test	107
$d\ \Delta HSIV_{t-1}$	0.006 (0.48)	0.63	RSS	43.722	BG test	Non Serially Corr.
$d\ CapContr_{t-1}$	0.337 (0.78)	0.44	AIC	2.344	BPG test	Homoskedastic

Most of the coefficients are still not significant, however some of them have a lower p-value then Eq. 1. Hence, this can be the right way where to start building a final better model. Anyway, after the introduction of the dummy d, generally speaking, it emerges that coefficients have a lower p-value and some of them are significant at 5% and 1% level. R^2 increased significantly, while the sum of squared residuals is the half. AIC decreased too. Residuals are better distributed, and not serially correlated anymore.

To obtain an even better model, starting from Eq. 2, some independent variables can be dropped. In order to decide if a regressor need to stay or not, variables will be eliminated starting from the less significant, until most of the variables will be significant or the model begins to deteriorate significantly in terms of R^2, RSS, AIC and quality of residuals. Following these rules, and by having conducted several test and regressions, the final model obtained is the following (Eq. 3):

$$\Delta NetCH_t = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4\, d\, X_1 + b_5\, d\, X_2 + b_6\, d\, X_3 + e \qquad (3)$$

Where d is still the usual dummy variable, while the three regressors are $\Delta\ NetCH_{t-1}$, $\Delta\ SSEC_{t-1}$ and $CapContr_{t-1}$ respectively.

The results of the estimation of Eq. 3 are reported on the following Table 6:

Table 6 – Estimation of Eq. 3

Dep. Variable: $\Delta NetCH_t$	06/2010 - 12/2018						
	Coeff. (t-stat)	p-value					
Intercept	-2.869 (-2.74)	0.01					
$\Delta NetCH_{t-1}$	0.386 (3.41)	0.00			Mean	0.000	Residuals
$\Delta SSEC_{t-1}$	-0.029 (-1.64)	0.10	# Obs.	102	Skewness	0.328	
$CapContr_{t-1}$	0.444 (2.7)	0.01	R^2	0.275	Kurtosis	7.737	
$d\ \Delta NetCH_{t-1}$	-0.854 (-4.7)	0.00	Adj. R^2	0.229	JB test	97	
$d\ \Delta\ SSEC_{t-1}$	0.051 (2.21)	0.03	RSS	46.694	BG test	Non Serially Corr.	
$d\ CapContr_{t-1}$	0.17 (3.19)	0.00	AIC	2.194	BPG test	Homoskedastic	

Eq. 3 can be considered the more specific model with respect to Eq. 2. In fact, the former encompasses only three independent variables, a constant and a dummy variable. Although this simplicity, the quality of the estimation is similar, if not better. Indeed, all the regressors are significant at least at a 10% level. The adjusted R^2 is higher in Eq. 3, and even its AIC is better. Residuals are as good as in Eq. 2.

To be completely sure that no information was lost in this simplification process, Eq. 3 should be analyzed also without the products between the regressors and the dummy variable. The new equation (Eq. 4) must have the same independent variable of Eq. 3:

$$\Delta NetCH_t = b_0 + b_1\, X_1 + b_2\, X_2 + b_3\, X_3 + e \qquad (4)$$

Eq. 4 has been tested both with Bai-Perron multiple breakpoint test and Chow breakpoint test. Both tests confirm that also the model represented by Eq. 4 has a structural change in November 2014, at 1% significance level. This imply that, within the two models, everything has been simplified without losing generality and goodness. For these reasons Eq. 3 can be considered the final model for explaining the monthly variation of net equity holdings between the U.S. and China (mainland).

Equity holdings between U.S. and Hong Kong

In this sub-section all the procedures and the tests are the same of the precedent sub-section, the one about change in equity holding between U.S. and China (mainland). However, this time the dependent variable is the already introduced $\Delta NetHK_t$, consequently the LDV becomes $\Delta NetHK_{t-1}$. This time the initial model is the following one:

$$\Delta NetHK_t = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + e \qquad (5)$$

Where except for X_1 that is $\Delta NetHK_{t-1}$, all the other independent variables are the same used in Eq. 1, even with the same order.

What follows (Table 7) are the results of the LS multiple regression conducted on Eq. 5

Table 7 - Estimation of Eq. 5

Dep. Variable: $\Delta NetHK_t$	06/2010 - 12/2018 Coeff. (t-stat)	p-value			Residuals	
Intercept	0.07 (0.41)	0.68				
$\Delta NetHK_{t-1}$	0.358 (3.63)	0.00				
$\Delta USD/CNY_{t-1}$	-0.008 (-0.28)	0.78				
$\Delta SSEC_{t-1}$	0.005 (1.1)	0.27			Mean	0.000
$\Delta FTSEHK_{t-1}$	0.001 (0.12)	0.90	# Obs.	102	Skewness	-1.273
$\Delta SP500_{t-1}$	-0.002 (-0.12)	0.90	R^2	0.173	Kurtosis	10.378
ΔVIX_{t-1}	-0.001 (-0.33)	0.74	Adj. R^2	0.102	JB test	258
$\Delta HSIV_{t-1}$	0.002 (0.9)	0.37	RSS	4.917	BG test	Serially Correlated
$CapContr_{t-1}$	-0.008 (-0.27)	0.79	AIC	-0.018	BPG test	Homoskedastic

As before, being the first attempt, the estimated Eq. 5 is not that good, even if this time the LDV is already highly significant, and the R^2 is much higher if compared to the R^2 of the estimated Eq. 1. Anyway, residuals are still serially correlated. Even by looking at $\Delta\ NetHK$ plot (Figure 9) it seems that the variable displays the same different behavior after beginning of 2015. For this reason, if any breakpoint occurs, it should have happened within the usual period which goes from the end of 2014 to begin of 2015. The Bai-Perron test does not detect any breakpoint, not even when a smaller trimmer percentage is allowed. To obtain some more information about the structure of the model, also a Quandt-Andrews test has been performed. Similarly to the Bai-Perron test, this one checks for any unknown structural breakpoints in a model. This test basically executes a single Chow test at every observation between two dates (*Andrews, 2003).* The test has been conducted even with a trimming percentage of 10%, generating 81 possible breaks to compare, however not a single break emerged. One last way to detect whether a breakpoint occurs or not is to perform a Chow test at different dates. For the sake of honesty, this test was designed to check for a specific date that could have modify a model, and not for testing several random dates. Anyway, since from $\Delta\ NetHK$ plot (Figure 9) it seems that the variables changed its behavior between the 2014 and 2015, Eq. 5 has been tested with a Chow test for all the months between July 2014 and June 2015. This procedure identifies a breakpoint in August 2014. For all the results of the tests, and some more information, please refer to APPENDIX C - Chow tests for Hong Kong Holdings. Looking from a stock-connect-implementation point of view, August 2014 is not such a meaningful date. In fact, the last event that precedes this date is when Premier Li Keqiang announced the Connect (April 2014), while the next event after this date was when SSE published relevant rules of the Connect (September 2014).

Since the only evidence of a breakpoint within Eq. 5 falls in August 2014, to stabilize the model, similarly to how it was done in the previous sub-section, a dummy variable d will be added to Eq. 5. This time, the dummy variable will take value of 0 up to July 2014 and 1 from August 2014 onwards. To the initial Eq. 5 it will be added also all the products between the regressors and the dummy itself. The new equation is the following (Eq. 6):

$$\Delta NetHK_t = b_0 + b_1\, X_1 + b_2\, X_2 + b_3\, X_3 + b_4\, X_4 + b_5\, X_5 + b_6\, X_6 + b_7\, X_7 + b_8\, X_8 + \ b_9\, d + b_{10}\, d\, X_1 + b_{11}\, d\, X_2 + b_{12}\, d\, X_3 + b_{13}\, d\, X_4 + b_{14}\, d\, X_5 + b_{15}\, d\, X_6 + b_{16}\, d\, X_7 + b_{17}\, d\, X_8 + e \quad (6)$$

The regressor are the same of Eq. 5. In Table 8 are reported the results of the regression conducted on the new Eq. 6:

Table 8 – Estimation of Eq. 6

Dep. Variable: $\Delta NetHK_t$	Eq. 6						
	Coeff. (t-stat)	p-value					
$Intercept$	1.875 (2.33)	0.02					
$\Delta NetHK_{t-1}$	0.36 (3.4)	0.00					
$\Delta USD/CNY_{t-1}$	-0.144 (-2.35)	0.02					
$\Delta SSEC_{t-1}$	0.013 (1.73)	0.09					
$\Delta FTSEHK_{t-1}$	0.005 (0.45)	0.65					
$\Delta SP500_{t-1}$	-0.028 (-1.56)	0.12					
ΔVIX_{t-1}	-0.007 (-2.04)	0.04					
$\Delta HSIV_{t-1}$	0.005 (1.38)	0.17					
$CapContr_{t-1}$	-0.287 (-2.3)	0.02					
d	-1.967 (-2.11)	0.04					
$d\ \Delta NetHK_{t-1}$	-0.562 (-1.64)	0.10					
$d\ \Delta USD/CNY_{t-1}$	0.146 (2.08)	0.04					
$d\ \Delta SSEC_{t-1}$	-0.008 (-0.71)	0.48			Mean	0.000	Residuals
$d\ \Delta FTSEHK_{t-1}$	-0.007 (-0.42)	0.68	# Obs.	102	Skewness	-2.108	
$d\ \Delta SP500_{t-1}$	0.031 (1.14)	0.26	R^2	0.310	Kurtosis	14.938	
$d\ \Delta VIX_{t-1}$	0.008 (1.85)	0.07	Adj. R^2	0.170	JB test	681	
$d\ \Delta HSIV_{t-1}$	-0.004 (-0.96)	0.34	RSS	4.104	BG test	Serially Correlated	
$d\ CapContr_{t-1}$	0.315 (2.02)	0.05	AIC	-0.022	BPG test	Homoskedastic	

Table 8 suggests that the introduction of the dummy d benefited the model. Most of the coefficients are already significant at least at a 10% significant level. All the statistics of the regression have improved, namely higher R^2 and adjusted R^2, lower RSS and AIC. However, the quality of residuals decreased significantly, and they are still serially correlated.

We will go through the same procedure used before, that is dropping most non-significant regressors. After several test and regressions, the final model is the following (Eq. 7):

$$\Delta NetHK_t = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 d + \\ b_6 d X_1 + b_7 d X_2 + b_8 d X_3 + b_9 d X_4 + e \qquad (7)$$

Where d is still the usual dummy, while the four regressors are respectively: $\Delta\ NetCH_{t-1}$, $\Delta\ USD/CNY_{t-1}$, $\Delta\ SSEC_{t-1}$ and $\Delta\ CapContr_{t-1}$.

The results of the estimation of Eq. 7 are reported on Table 9:

Table 9 – Estimation of Eq. 7

Dep. Variable: $\Delta NetHK_t$	Eq. 7						
	Coeff. (t-stat)	p-value					
$Intercept$	1.519 (1.97)	0.05					
$\Delta NetHK_{t-1}$	0.38 (3.76)	0.00					
$\Delta USD/CNY_{t-1}$	-0.118 (-2.2)	0.03					
$\Delta SSEC_{t-1}$	0.01 (1.74)	0.09					
$\Delta CapContr_{t-1}$	-0.235 (-1.96)	0.05			Mean	0.000	Residuals
d	-1.651 (-1.93)	0.06	# Obs.	102	Skewness	-1.807	
$d\ \Delta NetHK_{t-1}$	-0.643 (-2.09)	0.04	R^2	0.262	Kurtosis	12.815	
$d\ \Delta USD/CNY_{t-1}$	0.126 (2.09)	0.04	Adj. R^2	0.190	JB test	464	
$d\ \Delta SSEC_{t-1}$	-0.007 (-0.91)	0.37	RSS	4.389	BG test	Non Serially Corr.	
$d\ \Delta CapContr_{t-1}$	0.272 (1.92)	0.06	AIC	-0.112	BPG test	Homoskedastic	

Also in this case Eq. 7 can be considered the more specific model with respect to Eq. 6. Except for coefficient b_8, all the others are significant at least at a 10% level. Overall, the adjusted R^2 increased while both RSS and AIC decrease. Residuals are not serially correlated anymore, and they have also better distribution, even if not perfectly normally distributed.

Last step, as done previously, is to check if Eq. 7 without the dummy variable d and its product with regressors, namely the new Eq. 8, has the same structural changes. The new Eq. 8 must have the same independent variable of Eq. 7:

$$\Delta NetHK_t = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + e \tag{8}$$

Eq. 8 has been tested firstly with Bai-Perron multiple breakpoint test. Anyway, the result of this test is still negative: no breaking points detected. Then, estimated Eq. 8 has been tested through Quandt-Andrews test. By setting the trimming percentage at 40%, for a total of 21 breaks compared, it emerges that actually the model has a breakpoint in August 2014, even if it is not significant, since its p-value is 11%. For this reason, it has conducted several Chow tests, with the same modality explained before, hence by testing each potential month between July 2014 and June 2015. What emerges is that the most significant break occurs in August 2014, at a 5% level of significance, as displayed by the second table in APPENDIX C – Chow test for Hong Kong holdings. These two results together, imply that, within Eq. 6 and Eq. 7, everything has been simplified without losing generality and goodness. For these reasons Eq. 7 can be considered the final model for explaining the monthly variation of net equity holdings between the U.S. and Hong Kong.

Discussion

What obtained so far are two estimated equations, one for the variation in net holdings between the U.S. and China (Eq. 3.1) and one that describe the variation of net holding between the U.S. and Hong Kong (Eq. 7.1):

$$\begin{aligned} \Delta NetCH_t = -2.87 + 0.39\Delta NetCH_{t-1} - 0.03\Delta SSEC_{t-1} + 0.44CapContr \\ -0.85d\Delta NetCH_{t-1} + 0.05d\Delta SSEC_{t-1} + 0.17\mathrm{d}CapContr + e \end{aligned} \quad (3.1)$$

$$\begin{aligned} \Delta NetHK_t = 1.52 + 0.38\Delta NetKH_{t-1} - 0.12\Delta USD/CNY_{t-1} + 0.01\Delta SSEC_{t-1} - 0.24CapContr \\ -1.65d - 0.64d\Delta NetHK_{t-1} + 0.13d\Delta USD/CNY_{t-1} - 0.01d\Delta SSEC_{t-1} + 0.27\mathrm{d}CapContr + e \end{aligned} \quad (7.1)$$

As reported in Table 6 and Table 9, almost all the coefficients are significant. However, to better understand what the changes in the models are, before and after the breakpoint dates, some additional considerations are needed. In Eq. 3 (and Eq. 3.1) there are just three independent variables and a dummy. This imply that, each independent variable has a coefficient that last for the whole timeframe (June 2010 – December 2018) and a second one that must be added to the first one when considering dates after November 2014. For instance, referring to independent variable X_1 in Eq. 3, its coefficients are b_1 before November 2014, but after this month it is $b_1 + b_4$ because of the interaction with the dummy variable. The same holds for Eq. 7 and Eq. 7.1 but this time there are four independent variables and a dummy. Moreover, in this latter case also the intercept's coefficient changes within the two sub-sample. That said, it is important to understand not only the sign and the value of the summed coefficients, but also if they are statistically significant or not. That is because summing together two or more significant coefficients does not imply that also the summed coefficient will be significant.

To compute the significance of the summed coefficients a Wald test is enough. Its test statistic is based on the unrestricted model, and it measures how close the unrestricted estimates come to satisfying the restrictions under the null hypothesis (e.g. $b_1 + b_4 = 0$ for Eq. 3.1). Indeed, if the restriction holds, then the unrestricted estimates and restricted ones should be similar, otherwise the restriction does not hold. What follows are the result of the test for China holdings (Table 10) and Hong Kong holdings (Table 11):

Table 10 – Impact of independent variables of Eq. 3 before and after the breakpoint date (November 2014)
** Significant at 10%; **5%; ***1%. (t-stat)*

Dep. Variable: $\Delta NetCH_t$	06/2010 - 10/2014	11/2014 - 12/2018
Intercept	-2.869 (-2.74) ***	
$\Delta NetCH_{t-1}$	0.386 (3.41) ***	-0.468 (-3.30) ***
$\Delta SSEC_{t-1}$	-0.029 (-1.64) *	0.022 (1.51)
$CapContr_{t-1}$	0.444 (2.7) ***	0.614 (2.90) ***

Table 11 – Impact of independent variables of Eq. 7 before and after the breakpoint date (August 2014)
** Significant at 10%; **5%; ***1%. (t-stat)*

Dep. Variable: $\Delta NetHK_t$	06/2010 - 07/2014	08/2014 - 12/2018
Intercept	1.519 (1.97) **	-0.132 (-0.35)
$\Delta NetHK_{t-1}$	0.38 (3.76) ***	-0.263 (-0.91)
$\Delta USD/CNY_{t-1}$	-0.118 (-2.2) **	0.009 (0.31)
$\Delta SSEC_{t-1}$	0.01 (1.74) *	0.004 (0.74)
$CapContr_{t-1}$	-0.235 (-1.96) **	0.037 (0.48)

About Table 10 and the final model that describe the monthly change in net equity holding between the U.S. and China (mainland), almost all the coefficients remain significant. Discussing about their values, it emerges that:

The intercept has been kept constant over the whole sample. Recalling that, differently from the regressors, the dependent variable is not multiplied by any constant, a value of -2.87 implies that when all the regressors are equal to zero, on average the net equity holdings decrease by 287%. However, a situation where all the regressors have a zero value at the same time is unrealistic. Especially because of the last variable, since it never had a zero value. In other words, in this model, the intercept is not economically meaningful.

The dependent variable before November 2014 was positively related to its last precedent value, namely $\Delta NetCH_{t-1}$. Meaning that if one month net holdings had increased by 1%, the next month, the holdings would have increased by 0.39% due to the fact that the previous month they increased by 1%. Anyway, this is not true after November 2014. Indeed, after this date $\Delta NetCH_{t-1}$ becomes negatively correlated with the dependent variable. More precisely, after November 2014 when in the previous month net holdings increased by 1%, the month after they decrease by 0.47%. From an economic point of view this change in investors behavior is hard to justify. Moreover, it cannot be related to features of the Chinese stock market since the correlation between SSEC returns and the same returns but lagged by one month is slightly positive (correlation of 0.234), while their lagged volatilities are almost not related (correlation of -0.017). The same is true for the S&P500, since the model consider the Net holdings, which are affected also by equity inflows and outflows to the U.S. To simplify, this implies that investors on average buy one month and sell the other, but this dynamic is not related to characteristics of the two markets considered, since these markets more or less follow a trend and not an alternating pattern.

Before the breakpoint when the SSEC reported a return of +1%, the month after there was a negative variation in net holdings of -2.9%. However, after the implementation of the Connect this is not true anymore. On the contrary when the SSEC reports a return of +1% the net equity holdings are likely to increase by 2.2% the month after. Economically speaking this change in the coefficient is understandable. Indeed, after the implementation of Connect investors are more facilitated to enter and to leave the markets. Thus, when the Chinese market performs well there will be more investments in it, i.e. equity inflows, while when it underperforms, investors will withdraw their money, which is by definition an outflow of capital.

Finally, when looking at the Capital Control Index, when it increased by 1 point, the month after, net equity holdings were likely to increase by 4.44% before the implementation of Connect. After this event, when the index increases by 1 point, the net equity holdings probably will rise by 6.14% the month after. Just a clarification before discussing this dynamic. The variable $CapContr$ is 10 times the actual underlying Capital Control Index. Moreover, it is important to remember that within the sample, this index ranges between 0.441 and 0.684, which is why expecting a +1 is unrealistic. In other words, a more reliable magnitude for the index could be $\pm$ 0.01, and the relative response of the dependent variable should be adjusted accordingly. The fact that in both sub-sample the variations in net holdings are positively correlated with control of capital may be understandable. In fact, a tightening in capital control may discourage investors to buy Chinese stocks (or incentive to buy American stocks); however, at the same time, it also means that it is more complicated to invest outside China (for Chinese) and it is also more complicated to withdraw investment for

Americans. In other words, if Control of capital increase, there are less outflows. Capital control, in fact, is about country's measures to control its international capital flow, included the prevention of capital outflow. More in general, it refers to the policies formulated by country's authorities to restrict capital account transactions, payment and transfer of funds (*Yang Liu, 2020)*. What it is not that easy to understand economically speaking is how it is possible that this effect increases after the implementation of the Connect which is something that should increase market liberalism, hence reduce the effect of government control on capital. However, precisely because stock Connect represents a greater level of liberalism, investors may not be discouraged by a tightening in control and so they continue to invest in China, independently from the level of control exercised by the government. This means that there will be equity inflows anyway, but due to the strengthen in capital control outflows are still more limited. This process leads just to inflows with almost no outflows, hence the net flow is positive, and so the net holdings increase.

About Table 11 and the final model that describes the monthly change in net equity holding between the U.S. and Hong Kong, all the coefficients are significant before August 2014, while after this date they become almost negligible both in magnitude and in significance. Leaving out for the moment that after the breaking, all the coefficients can be zero from a statistic point of view, from their analysis it emerges that:

The intercept went from 1.52 to -0.13 which is less than a tenth. In other words, after August 2014, when all the regressors are equal to zero, on average the net equity holdings decrease by 13% each month. Anyway, even in this model, the intercept is not economically meaningful.

The dependent variable before August 2014 was positively related to its last precedent value, that is $\Delta NetHK_{t-1}$. Meaning that if one month net holdings had increased by 1%, the next month, the holdings would have increased by 0.38%. Anyway, this is not true after August 2014. Indeed, after this date $\Delta NetHK_{t-1}$ becomes negatively correlated with the dependent variable. More precisely, after August 2014 when in the previous month net holdings increased by 1%, the month after they decrease by 0.26%. The same considerations as for the net inflows into China hold for this model. However, when considering the post-break period, it must be remembered that the coefficient is not significant anymore, hence it could be zero.

Before the breaking date, variations in net equity holdings were negatively related to changes in USD/CNY currency rate. If the exchange rate had reported a +1%, the month after there would have been a negative variation in net holdings of -11.8%. After August 2014, this variation is at most

+0.9% so a tenth of its previous magnitude. A negative relationship as the one before August 2014 is completely understandable. In fact, it means that every time the exchange rate goes up, namely the Renminbi depreciates, to exploit this opportunity of investment, there should be more outflows from China to the U.S. which have seen their currency appreciate. However, it must remembered that this model deals with Hong Kong, whose official currency is not the Renminbi. Differently said, it is surprising to see how this variable was significant before August 2014, even if it did not describe the exchange rate of Hong Kong. This feature of the coefficient suggests that before August 2014 investors potentially invested in Hong Kong as if it were China, simply because China was not approachable. After August they knew that a Connect should have allowed them to invest in mainland very soon, so they stopped to invest in the "usual" way and the exchange rate USD/CNY was not relevant anymore. That is: lower coefficient and statistical insignificance.

Before the breakpoint when the SSEC faced a return of +1%, the month after net holdings would have reported an increase of 1% as well. However, after August 2014 the SSEC coefficient is just 0.4% and it is also not statistically significant anymore. It seems that it is happened the same thing discussed in the previous point for USD/CNY exchange rate. Before August 2014 Investors invested in Hong Kong as if it were China (mainland) that is why they cared about a Chinese stock index even when they were not investing in the mainland. When they were about to invest in mainland, this index was not meaningful anymore inside Hong Kong model.

Finally, when Capital Control Index increased by 1 point, the month after, net equity holdings were likely to decrease by -2.35% before August 2014. This negative relation should not surprising that much. In fact, every time that the control of capital increase, investors become scared and wish to withdraw their investments. Since they were located in Hong Kong, and not into mainland, as seen from the previous literature (*Fu and Mercurio, 2021*), the Chinese government strength in capital control, did not affect Hong Kong region. That is, investors were free to withdraw their money, and investing elsewhere, namely in the U.S. for this model. After August instead, the coefficient become positive related with the independent variable, however, as happened with all the other coefficients, in absolute value it is almost neglectable (0.4%) and it is not significant anymore. And this could be yet another signal that when investors had the possibility to directly invest into mainland, they did it and they did not use Hong Kong as like-China (mainland) market anymore.

To judge if results from Hong Kong model can be reliable or not it is not straightforward. In fact, among all the breakpoint tests that were made, not all of them agree that a structural change actually occurs. Moreover, as Table 11 displays, after the breakpoint date none of the variable are statistically significant anymore. Not only, the breakpoint occurred in August 2014, which is two months before the implementation of the first Connect, so the evidence that the breakpoint is related to Connect can be questioned. Last but not least, residuals of the model are not good as the one from the Chinese model (Eq.3.1).

However, before taking a conclusion it is worthy also to say that among all the variables, except for the currency rate, all the others are present also in Chinese model. This is a strong evidence that Hong Kong and mainland markets are related, which is consistent with previous literature, as in *Wang, Tsai, and Lin (2016)*. In addition to this, it is interesting to see how even when considering Hong Kong market, the variables that turn out to be significant are all related to China. Indeed, the stock index which is meaningful inside the model was the SSEC and not the FTSE Hong Kong, the same is true for the Capital Control Index, which has been proven not to affect capitals base in Hong Kong (*Fu and Mercurio, 2021).* Finally, the currency rate which explained part of the variations in net equity holding in Hong Kong was the Chinese one. In addition to all of this the fact that after the break none of the variables are significant anymore may suggests that after August 2014 the previous model is not significant anymore; and since the pre-breakpoint model was actually a like-China model it could make sense that it does not hold anymore, once the Connect has been implemented. Someone can argue that Connect was implemented in November 2014, not in August 2014. Anyway, just to remember in April 2014 Premier Li Keqiang announced the Shanghai - Hong Kong Stock Connect, and in September 2014 the Shanghai Stock Exchange published all the relevant rules. Not only, Hong Kong has been an open market for several years, and its investors are far more rational than those in Mainland China (*Wang, Tsai, and Lin, 2016)*. That said, it could be that Hong Kong investors, being more rational, already knew that the Connect would be implemented soon because of the announcement, and they were just waiting for its rules disclosure to understand if it makes sense to stop using Hong Kong as if it was China and start to invest in the mainland as soon as it would have been possible. Moreover, it must be remembered that, as shown in the second table of APPENDIX C – Chow tests for Hong Kong holdings, a (less significant) breakpoint was also detected in September 2014, and this could support the arguments just introduced.

CONCLUSION

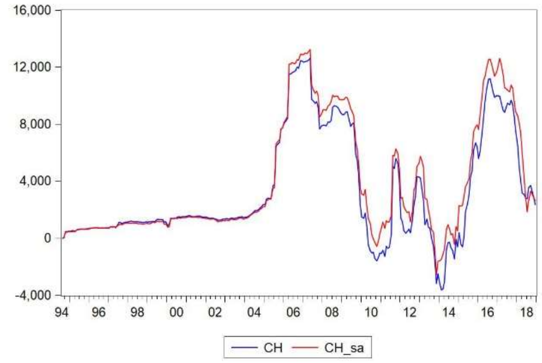
This study is about understanding whether or not the implementation of one or both the Stock Connect, i.e. SH – HK and SZ – HK, influenced in any possible way the flows of equity between the U.S. and China, both Mainland and the special administrative region of Hong Kong. All the models analyzed in this work have the monthly variation in net equity holdings instead of net flows as dependent variable, since this allows us to give an economic meaning to every regressor.

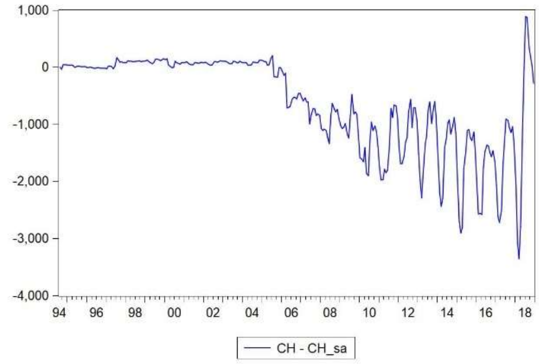
Results suggest that the second Connect, namely the one between Shenzhen and Hong Kong did not affect any of the flows. In contrast, the first Connect seems to have had a completely different impact. In fact, before its implementation investors seemed to use the Hong Kong market as if it was the mainland's market. Indeed, within this market, they cared about the USD/CNY exchange rate, looked at Shanghai stock exchange index and took into consideration also the extent of capital control exercised by Beijing.

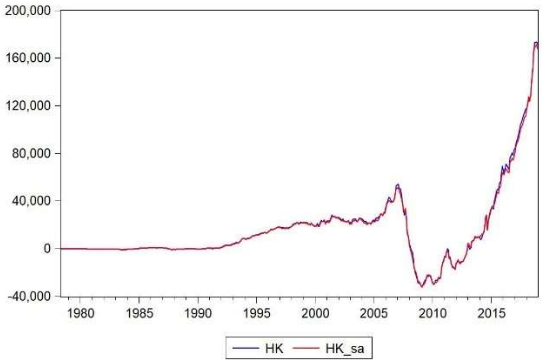
Three months before the implementation of Connect, and thus when its rules had been disclosed, Investors stopped to act like that and the model that described Hong Kong became insignificant and not meaningful anymore. As soon as Shanghai – Hong Kong stock Connect has been implemented, investors began to invest in mainland in a different way than before, but similar to the Hong Kong way before Connect. Indeed, equity net holdings variations have almost the same drivers than Hong Kong pre-Connect. Clearly, being different regions, some variables have different impact on the net flows, hence on net holdings. After Connect, when investors look at mainland markets, they seem to care about China stock returns and are not that scared anymore by a potential strengthening in Capital Control by Beijing.

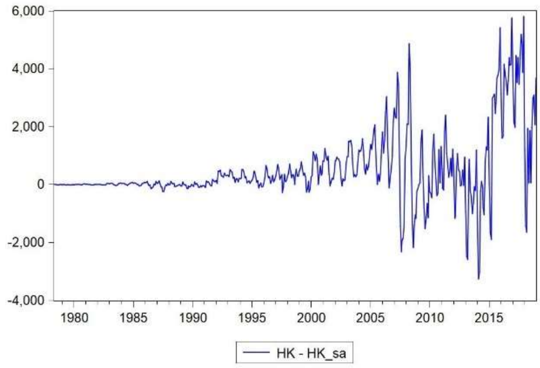
This research focused only on consequences due to the Connects, and it did not look either at the post pandemic situation, or at potential similarities with the implementation of previous programs such as Qualified Domestic Institutional Investor (QDII) and Qualified Foreign Institutional Investor (QFII). Future research can explore how these models behaves in a wider time frame, both before the Renminbi was unpegged from the US Dollar (June 2010), and after December 2018. Not only, what it is emerged is that after the implantation of the Connect, the Hong Kong model presented in this work is not significant anymore, but it would be interesting to understand what the new current drivers are. Finally, some further research can be conducted also to understand the potential reason behind the inversion in auto-regressive processes used inside the models, as well as what actually justifies an increased positive coefficient between net equity holdings of China (Mainland) and Capital Control Index in China (Mainland) model.

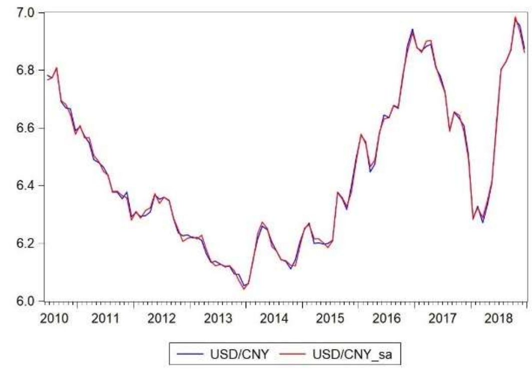
APPENDIX A – Seasonality of Data

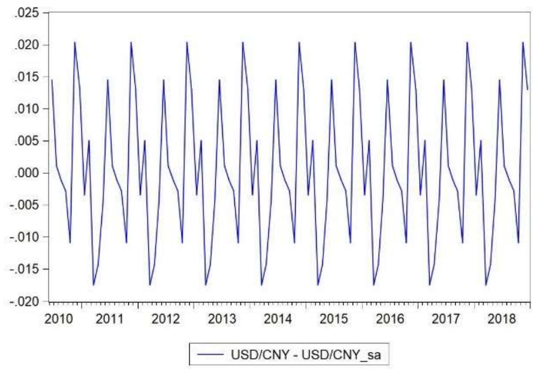


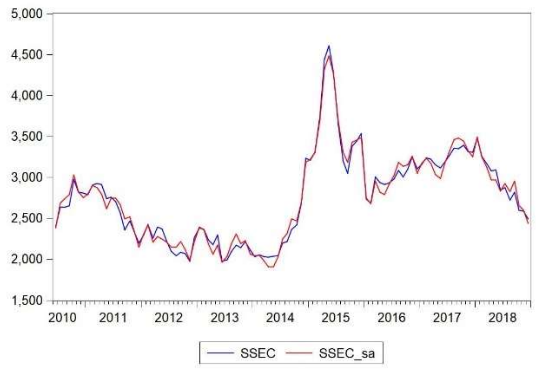


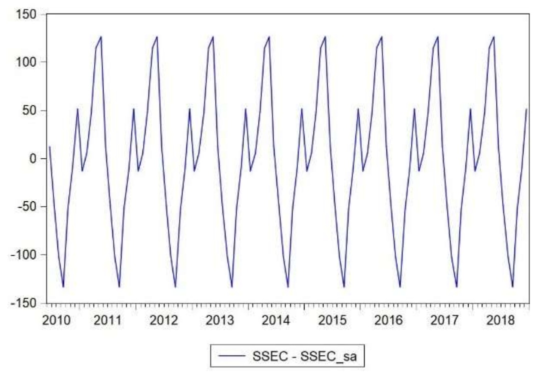


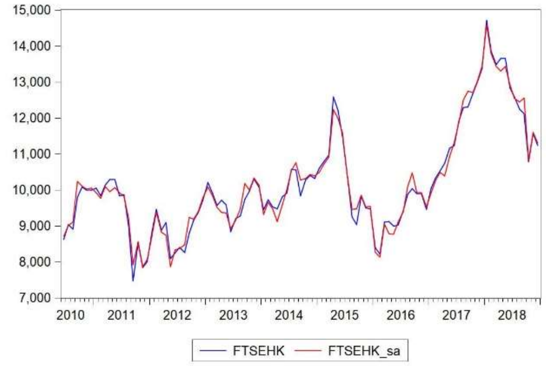








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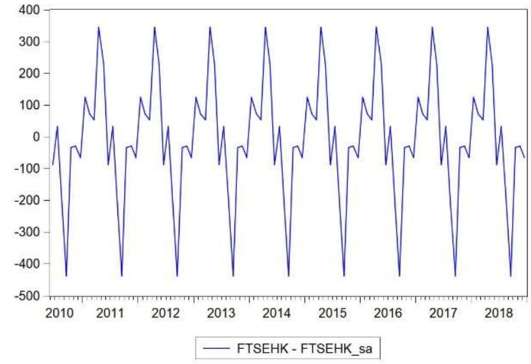
13,000
12,000
11,000
10,000
9,000
8,000
7,000
2010 2011 2012 2013 2014 2015 2016 2017 2018
FTSEHK
FTSEHK_sa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100
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-400
-500
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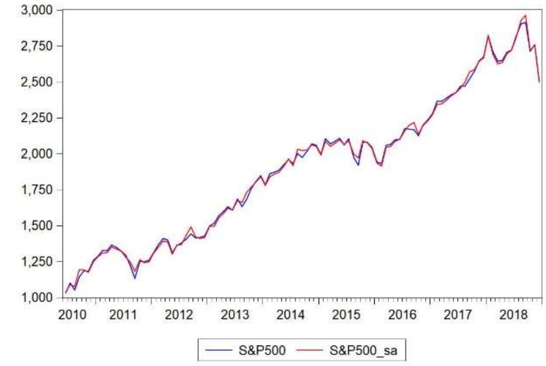
FTSEHK - FTSEHK_sa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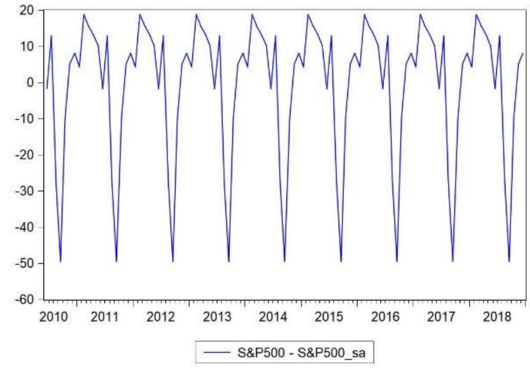
1,500
1,250
1,000
2010 2011 2012 2013 2014 2015 2016 2017 2018
S&P500
S&P500_sa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0
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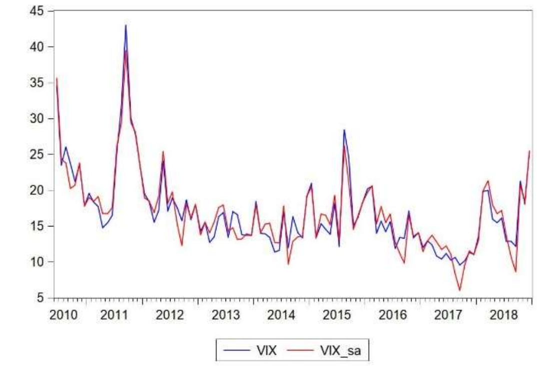
-30
-40
-50
-60
2010 2011 2012 2013 2014 2015 2016 2017 2018
S&P500 - S&P500_sa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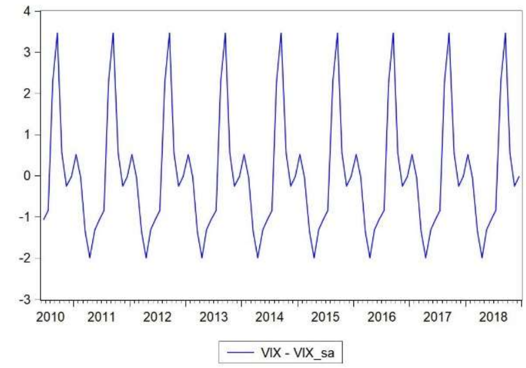
5
2010 2011 2012 2013 2014 2015 2016 2017 2018
VIX
VIX_sa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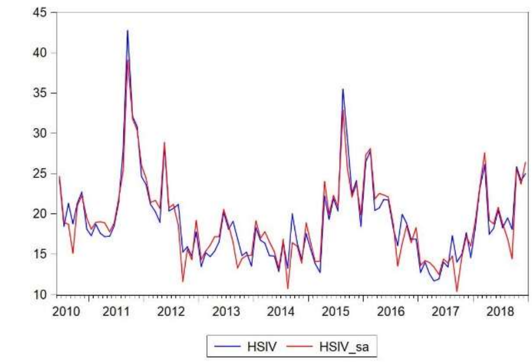
-3
2010 2011 2012 2013 2014 2015 2016 2017 2018
VIX - VIX_sa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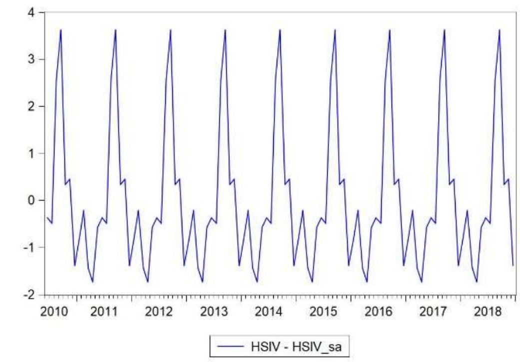
2010 2011 2012 2013 2014 2015 2016 2017 2018
HSIV
HSIV_sa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1
0
-1
-2
2010 2011 2012 2013 2014 2015 2016 2017 2018
HSIV - HSIV_sa

APPENDIX B – Variables used

Date	Δ NetCH	Δ NetHK	Δ USD/CNY	Δ SSEC	Δ FTSEHK	Δ SP500	Δ VIX	Δ HSIV	CapContr
30/06/2010	-0.28	0.05	-0.95	-3.29	5.31	-4.42	6.44	-13.26	6.84
31/07/2010	-0.76	0.10	0.08	11.84	3.27	5.31	-38.01	-26.21	6.77
31/08/2010	-1.11	-0.02	0.53	2.04	1.13	-1.12	-2.39	-1.27	6.77
30/09/2010	-0.98	0.02	-1.69	1.73	11.62	10.07	-16.06	-21.04	6.71
31/10/2010	-0.84	0.29	-0.19	8.32	-1.23	0.19	2.02	32.73	6.71
30/11/2010	0.58	0.31	-0.52	-6.87	-0.78	-1.47	14.11	5.74	6.71
31/12/2010	2.35	0.07	-1.04	-2.62	0.26	6.12	-29.20	-13.48	6.64
31/01/2011	1.22	0.37	0.47	1.70	-1.28	2.54	6.83	-7.16	6.64
28/02/2011	0.62	0.00	-0.64	3.35	-1.59	2.06	-3.36	4.39	6.64
31/03/2011	-0.38	0.65	-0.01	-0.67	3.21	0.13	3.76	0.42	6.64
30/04/2011	0.74	0.16	-0.94	-2.94	-1.38	3.01	-13.16	-0.67	6.64
31/05/2011	-0.07	-1.07	-0.32	-6.64	1.15	-1.14	0.09	-5.81	6.64
30/06/2011	0.03	-0.97	-0.53	4.94	-1.39	-0.94	4.79	5.93	6.64
31/07/2011	0.40	0.03	-0.22	0.01	-1.00	-3.31	39.51	14.73	6.64
31/08/2011	2.55	-0.53	-0.87	-2.97	-6.45	-2.63	11.72	14.47	6.71
30/09/2011	0.00	-0.24	0.03	-6.86	-15.18	-5.38	29.75	43.55	6.71
31/10/2011	0.08	-0.06	-0.24	1.11	7.83	6.72	-29.49	-20.89	6.71
30/11/2011	-0.05	-0.03	-0.12	-7.30	-8.50	-1.68	-4.77	-4.30	6.72
31/12/2011	-0.18	-0.03	-1.21	-8.69	2.59	0.62	-18.06	-15.73	6.51
31/01/2012	-0.42	0.26	0.48	7.09	7.43	4.58	-21.27	-6.17	6.51
29/02/2012	0.01	0.19	-0.37	4.95	7.63	2.93	-2.45	-13.22	6.51
31/03/2012	-0.22	0.09	0.42	-8.98	-6.06	3.35	-9.15	1.21	6.51
30/04/2012	-0.13	-0.25	0.14	2.97	-0.94	-0.59	12.72	-4.57	6.51
31/05/2012	-0.07	-0.06	0.77	-1.58	-10.62	-6.30	28.17	33.27	6.51
30/06/2012	0.05	0.07	-0.54	-1.47	5.83	4.79	-33.55	-32.97	6.45
31/07/2012	-0.38	0.04	0.34	-2.80	0.38	0.19	8.63	1.91	6.45
31/08/2012	0.59	0.07	-0.16	-0.10	1.20	4.81	-26.39	-13.05	6.45
30/09/2012	0.84	0.19	-0.99	3.19	8.65	3.85	-21.32	-46.67	6.45
31/10/2012	0.07	0.19	-0.62	-4.54	-0.50	-4.70	38.62	29.39	6.45
30/11/2012	0.39	0.34	-0.67	-6.39	2.30	-0.76	-11.37	-8.66	6.39
31/12/2012	0.04	0.69	0.18	10.85	3.90	0.50	11.24	29.20	6.32
31/01/2013	0.09	0.32	0.08	7.84	3.02	5.20	-26.99	-29.30	6.38
28/02/2013	-0.05	-0.05	-0.09	-1.63	-2.38	0.14	12.17	7.23	6.38
31/03/2013	-0.08	-0.48	0.19	-7.54	-3.41	3.78	-10.11	4.63	6.45
30/04/2013	-0.44	-0.65	-0.79	-5.90	-1.51	1.96	9.86	6.15	6.45
31/05/2013	-0.04	-0.17	-0.65	5.24	-0.08	2.26	12.67	0.03	6.46
30/06/2013	-0.27	0.31	-0.26	-10.02	-4.77	-0.77	1.75	18.03	6.38
31/07/2013	-0.26	0.02	0.07	3.76	2.69	3.95	-22.61	-9.86	6.38
31/08/2013	-0.56	0.44	-0.11	7.48	3.33	-0.76	3.00	-12.15	6.31
30/09/2013	-0.33	0.00	0.04	4.76	7.05	4.18	-11.39	-21.29	6.32
31/10/2013	-3.16	-0.06	-0.29	-5.07	-1.69	2.01	0.48	8.29	6.32
30/11/2013	-1.73	0.06	-0.55	1.64	3.31	1.94	5.45	2.48	6.23
31/12/2013	0.37	-0.09	-0.51	-7.71	-1.92	2.18	-1.54	0.55	5.99

31/01/2014	0.02	0.10	0.38	-0.89	-8.44	-3.43	26.50	24.83	5.99
28/02/2014	0.09	0.09	1.25	0.21	3.55	3.45	-24.28	-11.96	5.86
31/03/2014	0.22	0.13	1.52	-3.24	-1.86	0.87	8.17	4.83	5.86
30/04/2014	0.35	0.00	0.63	-3.78	-3.84	0.75	1.08	-7.14	5.86
31/05/2014	1.84	0.14	-0.35	0.06	4.96	2.26	-19.24	-7.94	5.73
30/06/2014	0.53	0.39	-1.00	6.24	4.26	2.51	-0.62	-14.61	5.73
31/07/2014	-0.29	0.32	-0.27	9.99	5.28	-2.28	34.30	24.13	5.59
31/08/2014	-0.64	0.10	-0.46	3.05	2.03	5.72	-60.72	-44.97	5.59
30/09/2014	0.36	-0.44	-0.05	7.38	-4.58	-0.44	28.18	42.38	5.59
31/10/2014	-2.29	0.45	-0.29	-1.00	0.37	0.29	4.81	-2.40	5.59
30/11/2014	2.96	0.18	-0.01	8.53	1.11	1.70	0.66	-14.02	5.59
31/12/2014	-0.36	0.10	1.12	16.75	-0.47	-0.56	34.74	30.63	5.60
31/01/2015	3.31	0.14	0.99	1.26	0.94	-2.98	6.28	-13.96	5.60
28/02/2015	-0.01	0.05	0.18	2.48	2.20	4.67	-42.47	-15.67	5.67
31/03/2015	0.03	-0.01	-0.77	11.30	1.86	-1.62	21.84	0.85	5.67
30/04/2015	0.27	0.06	-0.01	15.66	11.41	0.97	-0.63	52.53	5.67
31/05/2015	0.24	0.08	-0.22	3.60	-2.03	1.20	-8.81	-18.57	5.66
30/06/2015	0.07	0.11	-0.27	-5.04	-3.49	-1.55	24.18	11.14	5.53
31/07/2015	0.07	0.05	0.37	-13.88	-10.31	1.26	-39.75	-6.40	5.53
31/08/2015	0.30	-0.01	2.68	-11.52	-9.89	-4.48	70.19	45.45	5.47
30/09/2015	0.10	0.10	-0.29	-3.76	0.10	-1.51	-21.73	-25.12	5.47
31/10/2015	0.25	0.03	-0.47	7.52	3.96	5.89	-37.07	-14.60	5.47
30/11/2015	0.05	0.14	0.77	0.59	-3.36	-0.66	11.99	6.91	5.37
31/12/2015	0.02	0.07	1.58	0.94	0.11	-1.92	10.69	-17.66	5.06
31/01/2016	-0.04	0.00	1.52	-23.74	-14.39	-5.04	7.74	31.86	5.06
29/02/2016	0.13	-0.02	-0.48	-2.52	-1.46	-1.17	4.48	2.65	5.01
31/03/2016	0.15	0.06	-1.26	9.71	10.55	6.61	-29.67	-24.84	5.01
30/04/2016	0.11	0.02	0.35	-4.58	-2.98	0.38	14.49	2.80	5.01
31/05/2016	0.03	-0.02	1.47	-1.19	-0.19	1.68	-13.25	-0.78	4.87
30/06/2016	0.05	-0.02	0.72	4.45	3.77	0.66	7.41	-1.09	4.87
31/07/2016	0.05	-0.01	0.07	3.72	3.05	2.82	-27.22	-16.39	4.87
31/08/2016	0.00	0.14	0.64	5.15	7.23	1.72	-13.23	-32.69	4.81
30/09/2016	-0.03	0.02	-0.11	-1.57	3.71	0.89	-12.47	18.94	4.81
31/10/2016	-0.03	0.03	1.68	0.47	-5.33	-3.77	51.88	12.42	4.81
30/11/2016	-0.04	-0.02	1.16	3.34	-0.07	2.68	-19.61	-11.96	4.82
31/12/2016	0.03	0.04	0.97	-6.57	-4.03	1.68	3.46	10.69	4.82
31/01/2017	0.03	0.04	-0.72	3.86	3.95	1.94	-20.24	-29.64	4.61
28/02/2017	0.04	0.08	-0.27	1.99	3.48	3.05	12.15	4.56	4.75
31/03/2017	-0.03	0.03	0.57	-1.92	2.12	0.10	5.74	-1.56	4.75
30/04/2017	-0.06	0.01	0.05	-4.33	-0.83	1.01	-6.89	-4.29	4.75
31/05/2017	-0.08	0.04	-1.32	-1.63	5.07	1.28	-8.93	-7.15	4.75
30/06/2017	-0.01	0.04	-0.73	6.14	3.44	0.98	4.36	14.16	4.75
31/07/2017	-0.01	0.03	-0.62	4.35	4.79	1.32	-9.74	-3.32	4.55
31/08/2017	-0.01	0.01	-2.00	4.18	5.14	1.67	-29.02	5.86	4.55
30/09/2017	0.04	0.02	1.00	0.55	1.88	2.76	-31.69	-35.13	4.55
31/10/2017	-0.02	0.03	-0.19	-1.06	-0.21	0.62	46.53	34.80	4.41
30/11/2017	-0.09	0.03	-0.83	-3.50	2.49	2.20	17.92	15.90	4.41

31/12/2017	-0.08	0.00	-1.46	-2.16	3.10	0.87	-4.19	-7.58	4.41
31/01/2018	-0.03	0.05	-3.22	7.06	8.19	5.61	16.45	17.75	4.41
28/02/2018	-0.06	0.05	0.56	-7.13	-5.71	-4.51	42.32	20.04	4.67
31/03/2018	-0.09	0.05	-0.52	-4.17	-2.58	-2.62	6.97	16.78	4.61
30/04/2018	-0.19	-0.03	0.90	-5.04	-0.90	0.36	-17.39	-36.21	4.61
31/05/2018	-0.31	0.04	1.05	0.05	0.95	2.26	-6.84	-2.29	4.61
30/06/2018	-0.31	0.09	2.90	-4.62	-3.83	0.93	2.43	10.41	4.68
31/07/2018	-0.34	0.07	2.99	3.11	-2.98	3.02	-22.66	-10.36	4.68
31/08/2018	0.43	0.09	0.42	-3.38	-0.80	4.38	-25.68	-10.20	4.68
30/09/2018	0.24	0.04	0.58	4.40	0.88	1.18	-19.98	-15.82	4.68
31/10/2018	-0.07	0.00	1.64	-10.70	-14.88	-8.52	87.08	56.78	4.68
30/11/2018	-0.07	0.01	-0.71	-2.17	6.90	1.23	-12.17	-7.51	4.68
31/12/2018	-0.08	-0.02	-1.06	10.88	0.48	-9.76	4.17	4.75	4.68

APPENDIX C – Chow tests for Hong Kong holdings

Statistics of Chow tests conducted on Eq.5

Date	07/2014	08/2014	09/2014	10/2014	11/2014	12/2014
F-stat. prob.	0.09	0.07	0.14	0.49	0.59	0.59
Log lik. ratio prob.	0.04	0.03	0.07	0.37	0.47	0.46
Wald stat. Prob.	0.07	0.05	0.12	0.49	0.59	0.59
Date	**01/2015**	**02/2015**	**03/2015**	**04/2015**	**05/2015**	**06/2015**
F-stat. prob.	0.59	0.60	0.61	0.63	0.66	0.92
Log lik. ratio prob.	0.46	0.47	0.48	0.51	0.55	0.87
Wald stat. Prob.	0.59	0.60	0.60	0.63	0.66	0.92

The above table reports all the statistics of the Chow tests conducted on Eq. 5. The input dates for the tests go from July 2014 to June 2015. If any break occurs within this period, it is more likely that it happened in August 2014. Indeed, for this date all the statistics are significant at a 10% level, some of them also at a 5% level.

Statistics of Chow tests conducted on Eq. 8

Date	07/2014	08/2014	09/2014	10/2014	11/2014	12/2014
F-stat. prob.	0.07	0.04	0.05	0.13	0.50	0.54
Log lik. ratio prob.	0.05	0.03	0.04	0.11	0.46	0.50
Wald stat. Prob.	0.06	0.03	0.04	0.12	0.49	0.54
Date	**01/2015**	**02/2015**	**03/2015**	**04/2015**	**05/2015**	**06/2015**
F-stat. prob.	0.55	0.55	0.56	0.58	0.60	0.60
Log lik. ratio prob.	0.51	0.52	0.52	0.54	0.56	0.56
Wald stat. Prob.	0.55	0.55	0.55	0.58	0.59	0.59

The above table reports all the statistics of the Chow tests conducted on Eq. 8. The time span considered is always the same. At a 10% level of significance, both July, August and September can be considered as breaking points dates. However, between these three months, the most significant one is August, indeed all the statistics are significant even a t a 5% level. In other words, if any change occurs within this period, it is more likely that it happened in August 2014.

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