

IMF Working Paper

The Spillover Effects of a Downturn in China's Real Estate Investment

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Asia and Pacific Department

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Abstract

Real estate investment accounts for a quarter of total fixed asset investment (FAI) in China. The real estate sector's extensive industrial and financial linkages make it a special type of economic activity, especially where the credit creation process relies primarily on collateral, like in China. As a result, the impact on economic activity of a collapse in real estate investment in China—though a low-probability event—would be sizable, with large spillovers to a number of China's trading partners. Using a two-region factor-augmented vector autoregression model that allows for interaction between China and the rest of the G20 economies, we find that a 1-percent decline in China's real estate investment would shave about 0.1 percent off China's real GDP within the first year, with negative spillover impacts to China's G20 trading partners that would cause global output to decline by roughly 0.05 percent from baseline. Japan, Korea, and Germany would be among the hardest hit. In that event, commodity prices, especially metal prices, could fall by as much as 0.8–2.2 percent below baseline one year after the shock.

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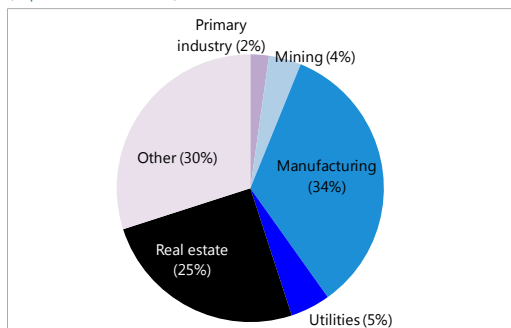
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I. INTRODUCTION

Real estate investment accounts for a quarter of total fixed asset investment (FAI) in China. The real estate sector's extensive industrial and financial linkages make it a special type of economic activity, especially where the credit creation process relies primarily on collateral, like in China. As a result, the impact on economic activity of a collapse in real estate investment in China—though a low-probability event—would be sizable, with large spillovers to a number of China's trading partners. Using a two-region factor-augmented vector autoregression model that allows for interaction between China and the rest of the G20 economies, we find that a 1-percent decline in China's real estate investment would shave about 0.1 percent off China's real GDP within the first year, with negative spillover impacts to China's G20 trading partners that would cause global output to decline by roughly 0.05 percent from baseline. Japan, Korea, and Germany would be among the hardest hit. In that event, commodity prices, especially metal prices, could fall by as much as 0.8–2.2 percent below baseline one year after the shock.

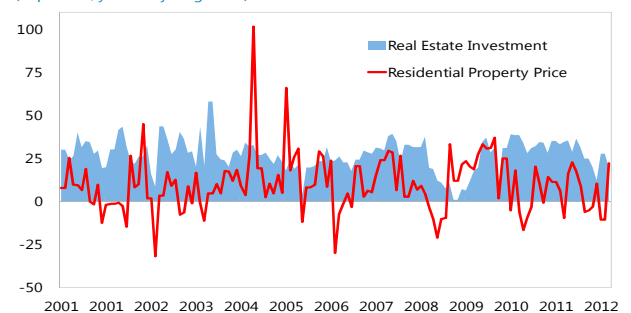
The relatively new private property market in China has always been susceptible to excessive price growth, requiring escalated intervention by the authorities over the years. The underlying structural features of the economy, namely low real interest rates in a high growth environment, the under-developed financial system (offering few alternative assets) and a closed capital account, foster overinvestment in real estate and create an inherent tendency for bubbles in the property market, posing risks to market sustainability and financial stability. Currently, real estate investment accounts for one quarter of China's fixed asset investment. It has been growing at around 30 percent per annum over the past two years (2010–2011)

Fixed Asset Investment: by Industry
(In percent of total, 2011)



Source: CEIC

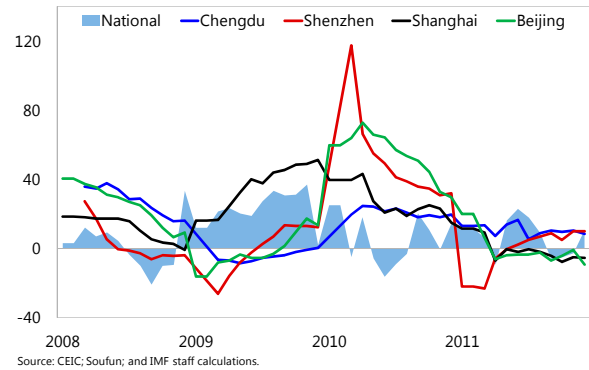
Property Price and Real Estate Investment
(In percent, year-on-year growth)



Policy response relies largely on quantity-based tools, the effectiveness of which tends to erode over time as more transactions are intermediated outside of the banking system, requiring more potent policy responses. In the most recent episode of property boom, which started around mid-2009, the authorities escalated its response with restrictions of second and third home purchases in larger cities and credit limits on property developers. Thus far, the authorities appear to have succeeded in curbing market exuberance while maintaining robust investment growth, chiefly through an expansion of social housing programs and a selective easing of financial conditions for first-time home buyers. Nevertheless, developers' financial conditions are deteriorating, and there is a tail risk that policy over-tightening could turn near-term price expectation decidedly negative as high inventory-to-sale ratios compress developers' profitability further, leading to a collapse in real estate investment.

Property Prices

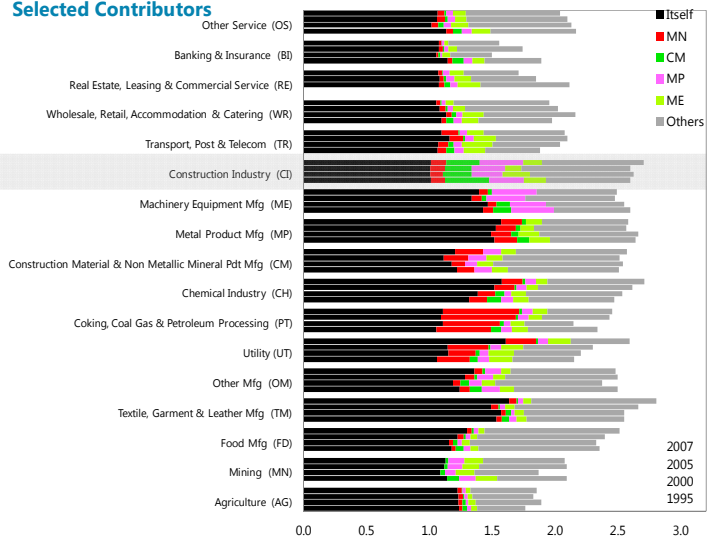
(In percent, year-on-year growth)



The risk to growth and financial stability of a collapse in real estate investment is high, based on the expected economic repercussion should that event come to pass. The analysis based on China's input-output data shows that the real-estate-dependent construction industry, which accounts for 7 percent of GDP, creates significant final demand in other domestic sectors; that is, it has among the highest degrees of backward linkages, particularly to mining, manufacturing of construction material, metal and mineral products, machinery and equipment, consumer goods, as well as real estate services. Moreover, real estate is used principally as collateral for external financing of private and state-owned enterprises as well as local government's investment projects, and other economic activities. As a result, a decline in real estate investment has the potential to disrupt the production chain throughout China's economy, and with that a potential for external spillover to G20 trading partners.

Backward Linkages:

Selected Contributors



II. MODELING THE SPILLOVER EFFECTS

We use a factor-augmented VAR (FAVAR) approach pioneered by Bernanke, Boivin and Elias (2005) to gauge the domestic and global spillovers of a slowdown in China's real estate investment in an event of a sharp property market correction. Following Boivin and Giannoni (2008), the FAVAR framework is extended into a two-region model that allows China to interact with the rest of the world (represented in this experiment by the other G20

economies). The analysis captures the feedback from China to the rest of the world, and vice versa, over time. It also captures the spillover effect between the rest of the G20 economies from a specific event originated in China.

The fact that market participants monitor hundreds of economic variables in their decision making process provides motivation for conditioning the analysis of their decisions on a rich information set. The FAVAR framework extracts information from the rich data set to gauge the impact of particular forces that may not be directly observable. These “forces” are treated as latent common components, which are inter-related, and their impacts on economic variables are traced through impulse response functions. By accounting for unobserved variables, there is a better chance that findings based on spurious association can be avoided.

More detailed description of the model and estimation strategy can be found in the appendix. Briefly, the model is a stable FAVAR in growth (except for balances and interest rates) with 5 common factors for each region (China and the rest of the G20 economies) and China’s real estate investment. The model uses one lag. The Cholesky factor from the residual covariance matrix is used to orthogonalize the impulses, which imposes an ordering of the variables in the VAR and treats real estate investment as exogenous in the period of shock. The results are robust to re-ordering within factor groups. The data set is a balanced panel of 390 monthly time series from the G20 stretching from 2000M1 to 2011M9, with 68 China’s variables and 322 from the rest of the world (see data description, transformation, and sources in Appendix B). Our sample contains at least one full cycle of real estate investment and property market in China. It covers the period when China entered the WTO and became increasingly integrated with the world economy.

Since the model is in growth, the experiment assumes an exogenous, temporary, one-standard-deviation growth shock to China’s real estate investment. The shock dampens within a few months and dissipates fully after around 36 months. Specifically, this is a one-time 49-percentage-point (seasonally adjusted, annualized) drop in real estate investment growth that reverts to trend growth largely within 4–5 months.² While this is a temporary, negative growth shock, the decline in real estate investment level is permanent. The shock is approximately equivalent to a 2-percent drop from baseline in real estate investment level 12 months after. The analysis does not assume policy response beyond that which was already in the sample.

² One standard deviation shock is equivalent to 3 percentage points in month-over-month, seasonally adjusted, growth rates.

Data	China (68 variables)	G20 ex-CHN (322 variables)
Real Economy	IP, Gross VA, Investment, Consumption, Floor space, Land area purchased/developed	IP
Labor	Urban employment	Employment (total/ non-farm)
Financial	M2, Credit, short-term interest rates, Shanghai Composite, USD/RMB	M2, credit, short-term interest rates, Treasury bond spreads, Stock Market Indices, USD/NC
Trade	Exports (components), Imports (components), trade balance	Exports, Exports to China, Imports, Imports from China, Trade balance
Prices	CPI, PPI, House price, Commodity prices (local)	CPI, PPI, Terms of trade, Commodity prices

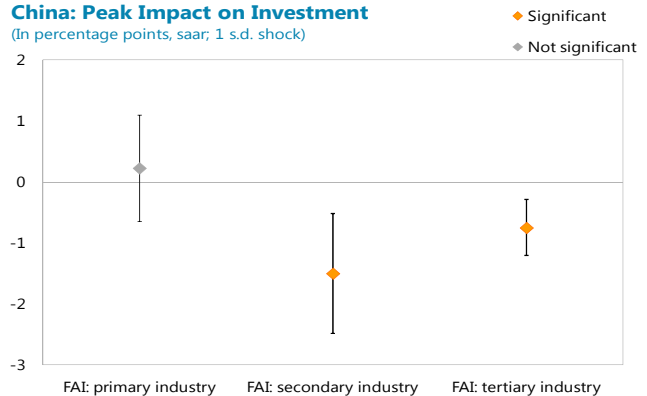
Twenty-four-month peak impacts to one-standard-deviation shock to real estate investment are reported with standard error bands in the charts below. Impacts on levels 12 months after the shock, in percent below baseline, are also derived and reported for comparison in Tables 1–4.

III. DOMESTIC FEEDBACK

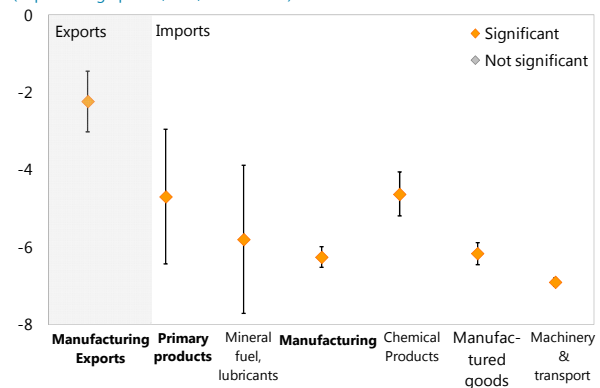
A rapid growth slowdown in real estate investment would reverberate across the economy, lowering investment in a broad range of sectors. Given strong backward linkages to other industries, especially manufacturing of construction material, metal and mineral products, machinery and equipment, a temporary, one-standard-deviation decline in real estate investment growth would cause investment in the manufacturing-heavy secondary industries to slow down by about 1½ percentage points at peak (within the first year). A slowdown in primary industry investment growth, which contains mining, is unclear. This translates approximately into a total FAI decline of about 0.8 percent from baseline level, 12 months after the shock (see Table 1).

Other components of demand respond in a consistent fashion. Export growth, particularly manufacturing exports, would fall by around 2¼ percentage points mainly

China: Peak Impact on Investment
(In percentage points, saar; 1 s.d. shock)



China: Peak Impact on Exports and Imports
(In percentage points, saar; 1 s.d. shock)

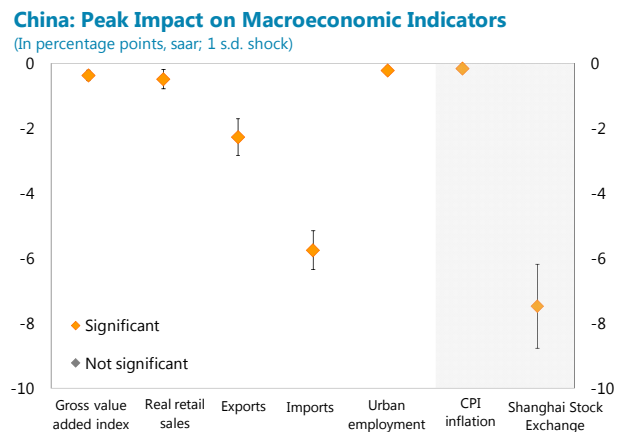


from diminishing trading partners' demand. The deterioration in domestic demand and weaker export growth would bring import growth down by roughly 5¾ percentage points at peak impact. Equivalently, exports and imports would fall by around 1.4 and 1.6 percent, respectively, below baseline levels, 12 months after the shock (see Table 1). A large fall in imports also reflects a significant share of processing trade in total trade. More important, the strong import responses reflect robust linkages of real estate activity to domestic industries that require inputs from abroad, namely manufacturing of construction material, mineral and metal products, as well as machinery and equipment.³ China's REER as well as the RMB/USD exchange rate do not seem to help cushion exports in a meaningful way even though the rate of appreciation (depreciation) appears to slow down (accelerate) slightly and lasts around 2–3 quarters.

Consumption would be dampened as income and wealth expansion (including house price appreciation and stock market valuation) slows down. Real retail sales would dip by 0.2 percent below baseline 12 months after (see Table 1). The end-result would be a drop in total industrial value added and output. All in all, industrial gross value added growth would fall by around 0.4 percentage points at peak, which is consistent with around 0.3 percentage points decline in real GDP on an annualized basis.⁴ The impact would be felt almost immediately and would start to dissipate after 4 quarters. This would translate into a decline of about 0.3 and 0.2 percent below baseline levels for industrial value added and GDP, respectively, one year out (Table 1).

CPI inflation would fall slightly, reflecting modest easing of price pressures as excess capacity diminishes along with demand growth.⁵ The overall growth slowdown is reflected in the stock market as well as labor market condition as employment growth slows in urban areas of China.

Worsened income and wealth would have important bearing on the overall and residential property markets. As demand conditions deteriorate, property market transaction volume and price would drop. For example, residential transactions volume growth would drop by around 7 percentage



³ The results are consistent with the input-output analysis, not shown in this note, which shows that machinery and equipment manufacturing as well as mining have the highest import coefficients, followed by chemical industry.

⁴ A one-percentage-point decline in real industrial value added growth is consistent with about 0.8 percentage point decline in real GDP growth for China.

⁵ For further discussion on excess capacity issues and their relationship with the investment drive in China, see IMF, 2012, People's Republic of China: Staff Report for the 2012 Article IV Consultation.

points at peak. One year out, residential real estate transaction volume would fall by 3 percent below baseline (see Table 1). House prices, on the other hand, would be cushioned by dwindling current and future housing supply (from shrinking housing starts). Measured using official house price statistics, which may understate residential property price inflation and deflation, house price growth would decline by around 3 percentage points at peak, or 1.5 percent below baseline 12 months after impact (Table 1). Meanwhile, the inflation in domestic prices of metal required for construction activity, such as aluminum, electrolyzed copper, and zinc would be shaved off by 1¼, 5, and 7⅓ percentage points, respectively. Deterioration in the property market climate is expected to have implications for financial institutions' balance sheets and financial stability as well. Nevertheless, without sufficient financial indicators at monthly frequency, the model cannot uncover the relationships between a property market slowdown and financial stability indicators.⁶

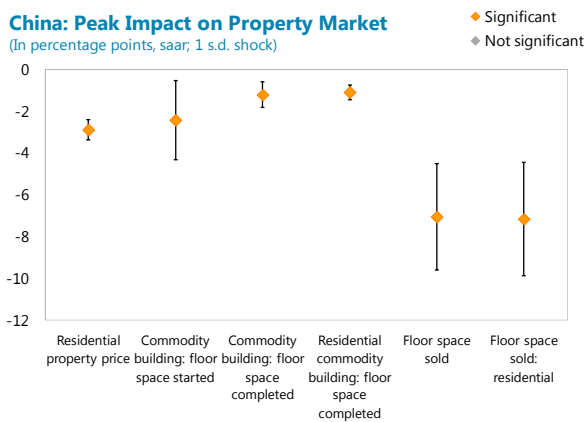


Table 1. Impacts one year after a 1-percent exogenous decline in China's real estate investment: Selected China Indicators

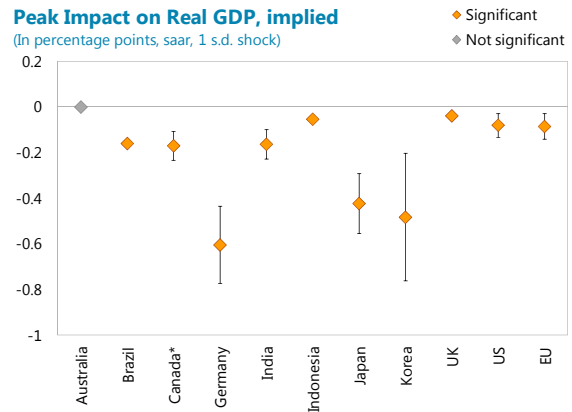
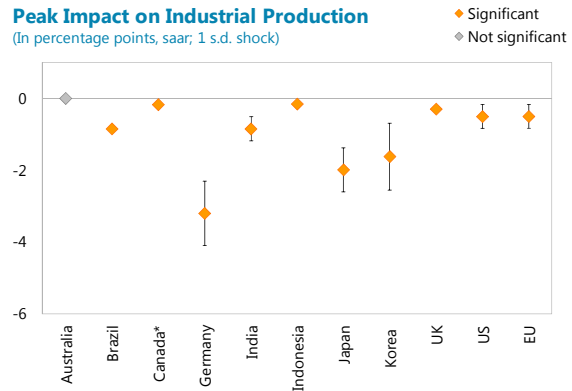
China Indicators:	(In percent, year-on-year)
Gross value added, real	0.1
GDP, real	0.1
Retail sales, real	0.1
Exports	0.7
Imports	0.8
Total FAI	0.4
Residential property:	
Price	0.7
Floor space sold	1.5

Remark: A one-standard-deviation decline in growth is equivalent to 2-percent decline in real estate investment levels from baseline

⁶ Data availability aside, financial exposures to the property sector are likely to be larger than official data suggest, considering the increasing prominence of off-balance-sheet activities at banks, trust company lending, the shadow banking system and unobserved inter-company lending, which could be property-related.

IV. GLOBAL SPILLOVER

A temporary shock to China’s real estate investment growth would have spillover implications around the world, with the impacts on G20 economies lasting approximately 4–5 quarters. In this exercise, the approximate impact on GDP growth would vary with the size of industrial production-to-GDP ratio in each economy.⁷ The implied peak impact on PPP-weighted G20 GDP growth is -0.2 percentage point, which translates to around 0.1 percent below baseline at 12 months after the shock originated in China (Table 2). Over all, capital goods manufacturers that have sizable direct exposure to China through exports to China in percent of own GDP and are highly integrated with the rest of the G20—therefore sharing adverse feedback from a negative shock in China with other trading partners, such as Germany, Japan, and Korea—would see more of the impact to industrial production and GDP. The results also show that global trade activity would decline (total exports and total imports for every G20 economy would weaken), which suggests that economies that derive significant benefit from global trade expansion and have deeper links via supply chain countries over the past decade, such as Germany and Japan, should be more hard hit in the second round (Table 3). Impact on Korea’s GDP peaks within the first 2 quarters and fades away more quickly, which is consistent with the fact that Korea’s direct exposure to China is large but second round effects through supply chain countries are smaller than Japan and Germany (also see Riad, Asmundson and Saito, 2012).



⁷ Industrial production is defined differently from country to country. The OECD definition includes production in mining, manufacturing, and public utilities (electricity, gas, and water), but excludes construction.

Table 2. Impacts one year after a 1-percent exogenous decline in China's real estate investment: Economic Activity Indicators
(In percent, year-on-year)

World Indicators:	Industrial Production	Real GDP
Argentina	0.52	0.10
Australia 1/	0.01	0.00
Brazil	0.28	0.05
Canada 2/	0.06	0.06
China 3/	0.12	0.10
France	0.15	0.02
Germany	0.64	0.12
India	0.27	0.05
Indonesia	0.02	0.01
Italy	0.47	0.08
Japan	0.50	0.11
Mexico	0.32	0.08
Russian Federation	0.23	0.05
Saudi Arabia	0.08	0.02
South Africa	0.29	0.04
Korea	0.19	0.06
Turkey	0.46	0.10
UK	0.08	0.01
US	0.20	0.03
EU	0.17	0.03
PPP-weighted average		0.06

Remark: A one-standard-deviation decline in growth is equivalent to 2-percent decline in real estate investment levels from baseline.

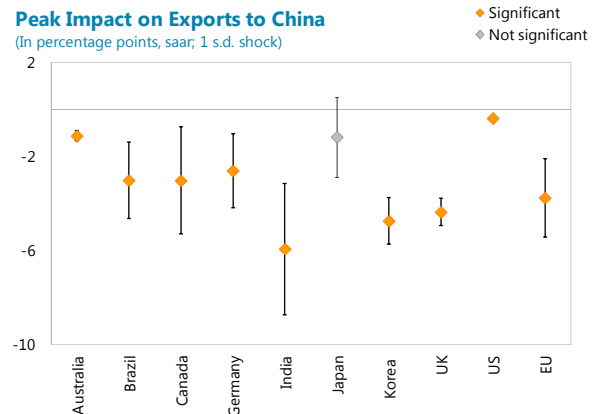
1/ Estimate for Australia is not statistically significant.

2/ Canada's economic activity is represented by monthly real GDP Index, all industries.

3/ China's industrial sector activity is represented by gross industrial value added.

Trade expansion with China and overall global trade would also slow as global and China demand growth weakens (Table 3). For U.K. and India, exports to China would bear the brunt of the impact, but because they are not important components of final demand in these economies, the impact on economic activity would be relatively moderate.⁸ Commodities exporters to China, such as Australia, Canada and Brazil, would also experience nonnegligible spillover effects on export growth.⁹ Australia's relatively large direct exposure to China should imply a larger direct impact, but there seems to be other forces that blunt effect on Australia's industrial production, for example the AUD exchange rate working as a shock absorber.

Nevertheless, other indicators, such as employment growth and total import growth (not shown here), point to a slowdown in Australia's economic activity. The impact on Indonesia's exports would likely come through China's coal demand. Because coal exports to China have risen sharply over the past few years, the impact on Indonesia's output could be larger today than shown in Table 2.



⁸ Exports to China are mostly in machinery, equipment and industrial supplies in the case of U.K. and mineral commodities and primary metal products in the case of India.

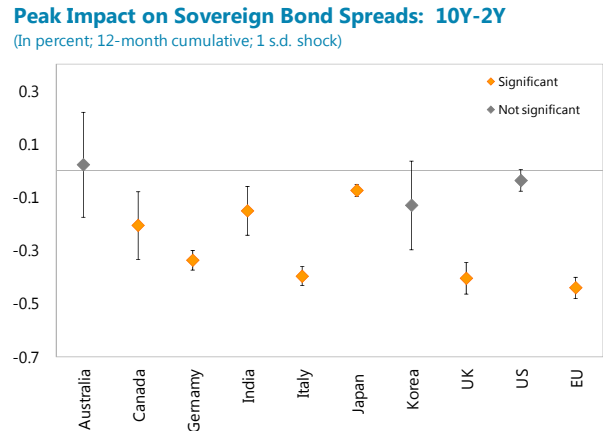
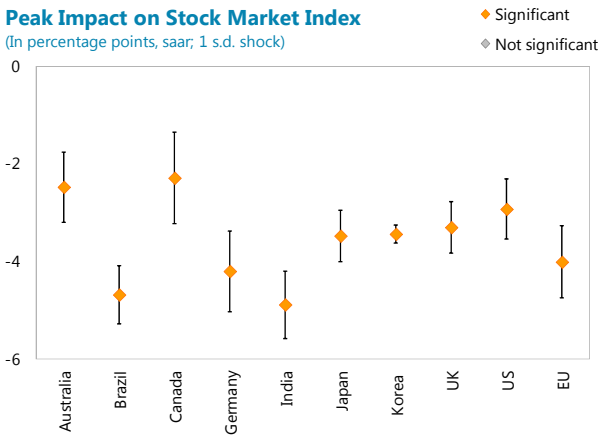
⁹ Canada's exports to China is more diversified in mineral and manufactured commodities.

Table 3. Impacts one year after a 1-percent exogenous decline in China's real estate investment: Trade Indicators
(In percent, year-on-year)

Trade Indicators:	Total Imports	Total Exports
Argentina	2.23	0.38
Australia	0.73	0.21
Brazil	0.97	0.69
Canada	0.90	0.85
China	0.78	0.68
France	0.75	0.88
Germany	0.74	0.81
India	0.51	0.95
Indonesia	0.00	0.82
Italy	0.98	1.02
Japan	0.83	0.64
Mexico	0.91	0.93
Russian Federation	0.81	0.73
Saudi Arabia	0.45	1.00
South Africa	0.84	0.20
Korea	0.65	0.78
Turkey	0.94	0.47
UK	0.92	0.94
US	0.90	0.61
EU	0.83	0.86
Weighted average	0.82*	0.76**

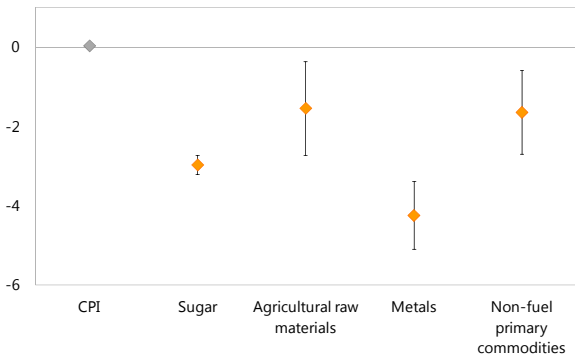
Remark: A one-standard-deviation decline in growth is equivalent to 2-percent decline in real estate investment levels from baseline.
*Import-weighted. ** Export-weighted.

The growth spillover effects are reflected in asset prices and valuation as well. Specifically, the impact on financial wealth generation as represented by the expansion of stock market indexes in G20 economies would be tangible—by as much as 8 percentage points in Brazil and between 6–7 percentage points in Germany and Japan—and would remain for as long as 4–5 quarters. Related to this, a general decline in sovereign bond spreads (cumulative over the first 12 months after impact) seems to signal concerns about future global growth, complementing the immediate impacts on industrial production shown earlier. In the U.S.’s case, the initial flattening of the yield curve is reversed around 2 quarters after the shock, which is suggestive of the U.S.’s recovery prospects could be faster than other G20 economies. The result for Australia is consistent with the estimated impact on that country’s industrial production.



Even as nonfuel primary commodity price inflation—especially metal price inflation—retreats, the impact on global inflation appears modest. Global growth slowdown and a drop in China’s demand for base metal imports, initiated by a China real estate investment decline, could lead to a drop in iron ore, aluminum, copper, lead, nickel, and zinc price growth of between 2¾–8 percentage points. The impact on overall metal prices could last 4 quarters, with up to 5–6 quarters for lead and zinc, possibly due to weaker supply response. This is equivalent to a decline in price levels of around 1½–4½ below baseline levels, one year out (Table 4). It is unclear how crude oil prices would be affected in this exercise—the impulse responses show a drop in crude price growth, with peak at around 3 quarters after impact, but are not statistically significant.

Peak Impact on World Prices
(In percentage points, saar; 1 s.d. shock)



Peak Impact on World Metal and Rubber Prices
(In percentage points, saar; 1 s.d. shock)

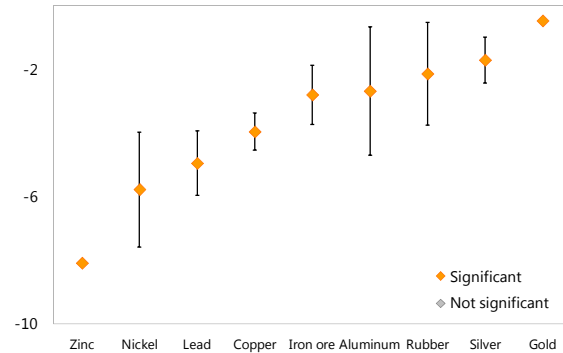


Table 4. Impacts one year after a 1-standard-deviation exogenous decline in China's real estate investment: Selected Commodity Prices

World Prices:	(In percent)
Metals	2.7
Non-fueled primary commodities	1.3
Zinc	4.3
Nickel	3.7
Lead	3.2
Copper	3.1
Iron ore	1.6
Aluminum	2.1
Rubber	1.6
Silver	1.5
Gold	0.4

Remark: A one-standard-deviation decline in growth is equivalent to 2-percent decline in real estate investment levels from baseline

V. CONCLUSION

Real estate investment account for a quarter of total fixed asset investment in China.

The impact on economic activity of a hypothetical collapse in real estate investment in China is sizable, with large spillovers to a number of China's trading partners. A 1-percent decline in China's real estate investment would shave about 0.1 percent off China's real GDP within the first year, with negative spillover impacts to China's G20 trading partners that would cause global output to decline by roughly 0.06 percent from baseline. Japan, Korea, and Germany would be among the hardest hit. In that event, commodity prices, especially metal prices, could fall by as much as 0.8–2.2 percent below baseline one year after the shock.

Overall, capital goods manufacturers that have sizable direct exposure to China—especially Japan and Korea—and are highly integrated with the rest of the G20—therefore sharing adverse feedback from a negative shock in China with other trading partners—such as Germany and Japan—would experience larger decline in industrial production and GDP. Worsened global growth prospects would be reflected in asset prices and sovereign bond spreads. In that event, commodity prices, especially construction-related metal prices, would also fall.

Our sample contains at least one full cycle of real estate investment and property market in China, and represents China's increasing integration with the world economy. Strictly from a statistical point of view, we expect a priority that this relatively short sample will make statistical relationships harder to detect and will be an important constraint on the richness of the models. Nevertheless, as the results suggest, there is still sufficient statistical information in the sample that allows us to learn something useful about China's interaction with the world in the recent past. It is important to stress, however, that China is more important to the global economy today than our sample would suggest and a China investment bust is not likely to be a linear event as measured by the model. The impact on G20 trading partners and therefore global growth today should be larger than we report.

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Appendix A: The China–G20 Macro Financial FAVAR

Why a FAVAR?

The factor-augmented vector autoregressive (FAVAR) approach offers a simple and agnostic tool to identify and measure the spillover effects of innovations in investment and real estate investment in China on various international macroeconomic, financial, trade, expectations and labor market variables. At the philosophical level, the approach works on a plausible assumption that policy makers and market participants face information constraints (similar to the econometrician) when they try to gauge economic conditions and developments, e.g. economic activity, price pressures, liquidity, and credit conditions, etc. They try to overcome these constraints by exploiting the information from a very large set of economic indicators

Technically, the approach offers a natural solution to the degrees-of-freedom problem in standard VARs by effectively conditioning VAR analysis of shocks on a large number of time series while exploiting the statistical advantages of restricting the analysis to a small number of estimated factors, which usefully summarize those time series. As it requires only a plausible identification of the shocks and not a precise identification (restriction) of the remainder of the macroeconomic model, simplicity of the VAR’s approach is retained.

By conditioning the analysis on a rich information set, the approach addresses three well-known criticisms of the low-dimensional VARs, structural VARs, and Bayesian VARs in several applications. First, it resolves the problem of mis-measurement of shocks or policy innovations—typically arising from the inability to control for information market participants or policy makers use—which leads to incorrect estimated responses of economic variables to those innovations.¹⁰ Second, it does not require the analysis to rest only on specific observable measures to represent certain economic concepts. For example, the concept of “economic activity” cannot be perfectly captured by one indicator, such as real GDP or industrial production. Including multiple indicators, e.g. retail sales and employment, could represent the concept better. “Price pressures” may be better represented by various measures of prices—CPI, PPI, commodity (metal, nonmetal, fuel or nonfuel) prices. “Interest rates” and “liquidity and credit conditions” cannot easily be represented by one or two series, but are reflected in a wider range of economic indicators.¹¹

Finally, for the purposes of policy analysis and model validation, the impulse responses can be observed for a large set of variables that policy makers and markets care about.

¹⁰ The “price puzzle”, which occurs in monetary VARs because the models do not capture the signals about future inflation central banks may have, is an oft-cited example, and is usually resolved in a clumsy, ad hoc manner in standard VARs.

¹¹ If a true system is a FAVAR, but is estimated as a standard VAR (with factors omitted), the estimated VAR coefficients and the impulse response coefficients will be biased.

The Model

Briefly, the model is a stable FAVAR in growth (except for balances and interest rates) with five common factors for each region (China and the rest of the G20 economies) and China’s real estate investment. The model uses one lag. The Cholesky factor from the residual covariance matrix is used to orthogonalize the impulses, which imposes an ordering of the variables in the VAR and treats real estate investment as exogenous in the period of shock. Specifically, the VAR ordering restricts China’s real estate investment to exogenously impact China’s common factors which then spillover onto global factors in the immediate period (one month) after the shock in a recursive fashion. By construction, there is no need to identify the factors separately because each region-specific set of common factors (or principal components) is an independent linear combination that spans the respective data set. The results are therefore robust to re-ordering within factor groups.

Formally, the FAVAR is described by a set of measurement equations (1), relating observed China data and those of the other G20 economies—the X ’s, which are listed in Appendix B—to their unobserved principal components¹² or factors, the C ’s; and a reduced-form state equation, which governs the dynamics of the factors (2), as follows:

$$\begin{aligned} X_t &= \Lambda C_t + e_t \\ X_t^* &= \Lambda^* C_t^* + e_t^*, \end{aligned} \tag{1}$$

$$\begin{bmatrix} C_t \\ C_t^* \end{bmatrix} = \begin{bmatrix} \Psi_{11}(L) & \Psi_{12}(L) \\ \Psi_{21}(L) & \Psi_{22}(L) \end{bmatrix} \begin{bmatrix} C_{t-1} \\ C_{t-1}^* \end{bmatrix} + \begin{bmatrix} u_t \\ u_t^* \end{bmatrix} \tag{2}$$

where * denotes the non-China factors; e ’s are mean-zero error terms, which are uncorrelated with the C ’s, but can be serially correlated and weakly correlated across indicators; and, finally, the u ’s are reduced-form mean-zero innovations that are cross-correlated. For China, C consists of unobserved common factors (F) to be estimated as well as observed fixed asset investment or real estate fixed asset investment (R), depending on the application. These C ’s should capture region-specific economic conditions or concepts that a few time series cannot represent adequately. The u ’s can be written and interpreted as the sum of global exogenous shocks, driven by some global shocks and region-specific disturbances (see Boivin and Giannoni, 2008).

Equation (1) relates the information time series X to the common “forces” C , which contains unobservable factors in F and observable variables in R . It also captures the idea that

¹² The principal components of a set of variables are obtained by computing the eigenvalue decomposition of the observed variance matrix. The first principal component is the unit-length linear combination of the original variables with maximum variance. Subsequent principal components maximize variance among unit-length linear combinations that are orthogonal to the previous components.

both F and R can be correlated in general, representing common forces that drive the dynamics of the data, X , in each economic region.

Equation (2) is a VAR in global factors, China factors, as well as China's real estate investment (or total investment in a different application). It specifies how these common forces evolve over time, and is usually interpreted as an atheoretic forecasting model. The off-diagonal elements of the matrix allow the shocks to affect the common factors of the other region both contemporaneously and over time. In essence, these off-diagonal matrix polynomials capture spillover effects across regions, which can be “switched on” or “off”. For instance, if the upper right element is set to zero, then the model is restricted to have no feedback to the rest of the world from China variables.

Estimation

Data are initially transformed to induce stationarity, as described in Appendix B. Then a two-step principal components approach is used to estimate the model (see Stock and Watson, 2002; and Bernanke, Boivin and Elias, 2005). In the first step, the common space spanned by the factors of X over time, or the $C(F,R)$, is estimated using the first principal components of X . Denote it by $\hat{C}(F,R)$. When the number of time series is large and the number of principal components used is at least as large as the true number of factors, the principal components consistently recover the space spanned by both F and R . Since $\hat{C}(F,R)$ corresponds to arbitrary linear combination of its arguments, obtaining \hat{F} requires determining the part of $\hat{C}(F,R)$ that is not spanned by R .

The second step involves estimating the FAVAR, equation (2), by standard methods with F replaced by \hat{F} . In theory, when the number of time series is large (in this case, 390) relative to the number of periods (in this case, 128), the uncertainty in the factor estimates can be ignored.

This procedure is computationally simple and imposes few distributional assumptions. This methodology provides a nonparametric way of estimating $C(F,R)$, i.e. it does not impose the structure of a parametric model with precise distributional assumptions in the measurement equations (1).

Identification

Two distinct sets of restrictions are imposed on the system (1)–(2). The first is a minimum set of normalization restrictions on the measurement equations (1), which are needed in order to estimate the model. This is the standard normalization implicit in the principal components. The normalization is done so that solutions to the estimation problem in (1), i.e. the estimated factors F and factor loading Λ , can be distinguished from any transformation that would also satisfy equation (1), conditional on observing X . Normalization does not affect the information content of the estimated factors. The second restrictions are imposed on the factors and their coefficients in the transition equation (2) to identify the shock.

The framework then identifies unforecasted innovation in real estate investment and traces out the impact of various economic variables of interest. This framework is more appropriate

for our analytical purpose than for monetary policy analysis, as the unforecasted portion of policy interest rate innovations are not interesting in the real world where central banks follow well known monetary policy rules and communicate their actions actively to influence markets.

The second set of restriction is the identification of the structural shocks in the transition equation (2). A recursive structure is assumed where all the factors entering (2) respond with a lag to change in the exogenous variable (real estate investment), ordered last. In this case, there is no need to identify the factors individually, but only the space spanned by the latent factors, F and C^* . The Cholesky factor from the residual covariance matrix is used to orthogonalize the impulses, which imposes an ordering of the variables in the VAR and treats real estate investment as exogenous in the period of shock. The results are robust to re-ordering within factor groups.

As a result, no further restrictions are required in (1) and the identification of the shock can be achieved in (2) as if it were a standard VAR.

Appendix B: Data Transformation and Sources

Appendix A. Data Sources and Transformations

Series	Country	Descriptor	Source	Transformations			
				DLOG of seasonally adjusted series	DLOG (series already seasonally adjusted by source)	Seasonal adjustment of level series	No transformation
Industrial Production Index							
s001	Argentina	AR: Industrial Monthly Estimates (Index 2000=100)	CEIC	✓			
s002	Australia	Australia: Industrial Production (Index 2000=100)	Haver	✓			
s003	Brazil	BR: Industrial Production Index (Index 2000=100)	CEIC	✓			
s004	Canada	Canada: GDP: All Industries (Index of: SAAR, Mil.Chn.2002.CS)	Haver		✓		
s005	France	FR: Industrial Production Index (Index 2000=100 SA)	CEIC		✓		
s006	Germany	DE: IPI: Manufacturing (Index 2000=100)	CEIC	✓			
s007	India	IN: Industrial Production Index (IPI) (Index 2000=100)	CEIC	✓			
s008	Indonesia	ID: Industrial Production Index (IPI) (Index 2000=100)	CEIC	✓			
s009	Italy	IT: Industrial Production Index (IPI) (Index 2000=100)	CEIC	✓			
s010	Japan	JP: Industrial Production Index (IPI): Mining and Manufacturing (Index 2000=100)	CEIC	✓			
s011	Korea	KR: Industrial Production Index (IPI) (Index 2000=100)	CEIC	✓			
s012	Mexico	MX: Industrial Production Index (Index 2000=100)	CEIC	✓			
s013	Russia	Russia: Output: Industrial Production Index: Total (NSA) (Index 2000=100)	Haver	✓			
s014	Saudi Arabia	Saudi Arabia: Crude Petroleum Production (Index 2000=100)	IFS	✓			
s015	South Africa	ZA: Manufacturing Production Index (Index 2000=100)	CEIC	✓			
s016	Turkey	TR: Industrial Production Index (IPI): NACE 2 (Index 2000=100)	CEIC	✓			
s017	UK	UK: Industrial Production Index: Seasonally Adjusted (Index 2000=100 SA)	CEIC		✓		
s018	US	US: Industrial Production Index (Index 2000=100)	CEIC	✓			
s019	EU	EU: Industrial Production Index (IPI): EU 27: excl Construction (Index 2000=100 SA)	CEIC		✓		
Total Exports							
s020	Argentina	Argentina: Exports to World (USD mn)	DOTS	✓			
s021	Australia	Australia: Exports to World (USD mn)	DOTS	✓			
s022	Brazil	Brazil: Exports to World (USD mn)	DOTS	✓			
s023	Canada	Canada: Exports to World (USD mn)	DOTS	✓			
s024	France	France: Exports to World (USD mn)	DOTS	✓			
s025	Germany	Germany: Exports to World (USD mn)	DOTS	✓			
s026	India	India: Exports to World (USD mn)	DOTS	✓			
s027	Indonesia	Indonesia: Exports to World (USD mn)	DOTS	✓			
s028	Italy	Italy: Exports to World (USD mn)	DOTS	✓			
s029	Japan	Japan: Exports to World (USD mn)	DOTS	✓			
s030	Korea	Korea, Republic of: Exports to World (USD mn)	DOTS	✓			
s031	Mexico	Mexico: Exports to World (USD mn)	DOTS	✓			
s032	Russia	Russian Federation: Exports to World (USD mn)	DOTS	✓			
s033	Saudi Arabia	Saudi Arabia: Exports to World (USD mn)	DOTS	✓			
s034	South Africa	South Africa: Exports to World (USD mn)	DOTS	✓			
s035	Turkey	Turkey: Exports to World (USD mn)	DOTS	✓			
s036	UK	United Kingdom: Exports to World (USD mn)	DOTS	✓			
s037	US	United States: Exports to World (USD mn)	DOTS	✓			
s038	EU	European Union (agg): Exports to World (USD mn)	DOTS	✓			
Total Imports							
s039	Argentina	Argentina: Imports from World (USD mn)	DOTS	✓			
s040	Australia	Australia: Imports from World (USD mn)	DOTS	✓			
s041	Brazil	Brazil: Imports from World (USD mn)	DOTS	✓			
s042	Canada	Canada: Imports from World (USD mn)	DOTS	✓			
s043	France	France: Imports from World (USD mn)	DOTS	✓			
s044	Germany	Germany: Imports from World (USD mn)	DOTS	✓			
s045	India	India: Imports from World (USD mn)	DOTS	✓			
s046	Indonesia	Indonesia: Imports from World (USD mn)	DOTS	✓			
s047	Italy	Italy: Imports from World (USD mn)	DOTS	✓			
s048	Japan	Japan: Imports from World (USD mn)	DOTS	✓			
s049	Korea	Korea, Republic of: Imports from World (USD mn)	DOTS	✓			
s050	Mexico	Mexico: Imports from World (USD mn)	DOTS	✓			
s051	Russia	Russian Federation: Imports from World (USD mn)	DOTS	✓			
s052	Saudi Arabia	Saudi Arabia: Imports from World (USD mn)	DOTS	✓			
s053	South Africa	South Africa: Imports from World (USD mn)	DOTS	✓			
s054	Turkey	Turkey: Imports from World (USD mn)	DOTS	✓			
s055	UK	United Kingdom: Imports from World (USD mn)	DOTS	✓			
s056	US	United States: Imports from World (USD mn)	DOTS	✓			
s057	EU	European Union (agg): Imports from World (USD mn)	DOTS	✓			
Goods Trade Balance							
s058	Argentina	Argentina: Trade Balance (USD mn)	DOTS			✓	
s059	Australia	Australia: Trade Balance (USD mn)	DOTS			✓	
s060	Brazil	Brazil: Trade Balance (USD mn)	DOTS			✓	
s061	Canada	Canada: Trade Balance (USD mn)	DOTS			✓	
s062	France	France: Trade Balance (USD mn)	DOTS			✓	
s063	Germany	Germany: Trade Balance (USD mn)	DOTS			✓	
s064	India	India: Trade Balance (USD mn)	DOTS			✓	
s065	Indonesia	Indonesia: Trade Balance (USD mn)	DOTS			✓	
s066	Italy	Italy: Trade Balance (USD mn)	DOTS			✓	
s067	Japan	Japan: Trade Balance (USD Mn)	DOTS			✓	
s068	Korea	Korea: Trade Balance (USD mn)	DOTS			✓	
s069	Mexico	Mexico: Trade Balance (USD mn)	DOTS			✓	
s070	Russia	Russia: Trade Balance (USD mn)	DOTS			✓	
s071	Saudi Arabia	Saudi Arabia: Trade Balance (USD mn)	DOTS			✓	
s072	South Africa	South Africa: Trade Balance (USD mn)	DOTS			✓	
s073	Turkey	Turkey: Trade Balance (USD mn)	DOTS			✓	
s074	UK	UK: Trade Balance (USD mn)	DOTS			✓	
s075	US	US: Trade Balance (USD mn)	DOTS			✓	
s076	EU	EU: Trade Balance (USD mn)	DOTS			✓	

Series	Country	Descriptor	Source	Transformations			
				D.LOG of seasonally adjusted series	D.LOG (series already seasonally adjusted by source)	Seasonal adjustment of level series	No transformation
Exports to China							
s077	Argentina	Argentina: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s078	Australia	Australia: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s079	Brazil	Brazil: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s080	Canada	Canada: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s081	France	France: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s082	Germany	Germany: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s083	India	India: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s084	Indonesia	Indonesia: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s085	Italy	Italy: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s086	Japan	Japan: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s087	Korea	Korea, Republic of: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s088	Mexico	Mexico: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s089	Russia	Russian Federation: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s090	Saudi Arabia	Saudi Arabia: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s091	South Africa	South Africa: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s092	Turkey	Turkey: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s093	UK	United Kingdom: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s094	US	United States: Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
s095	EU	European Union (agg): Exports to China,P.R.: Mainland (USD mn)	DOTS	✓			
Imports from China							
s096	Argentina	Argentina: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s097	Australia	Australia: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s098	Brazil	Brazil: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s099	Canada	Canada: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s100	France	France: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s101	Germany	Germany: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s102	India	India: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s103	Indonesia	Indonesia: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s104	Italy	Italy: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s105	Japan	Japan: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s106	Korea	Korea, Republic of: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s107	Mexico	Mexico: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s108	Russia	Russian Federation: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s109	Saudi Arabia	Saudi Arabia: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s110	South Africa	South Africa: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s111	Turkey	Turkey: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s112	UK	United Kingdom: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s113	US	United States: Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
s114	EU	European Union (agg): Imports from China,P.R.: Mainland (USD mn)	DOTS	✓			
Terms of Trade							
s115	Argentina	Argentina: Terms of Trade (yoy % growth)	Haver				✓
s116	Australia	Australia: Terms of Trade: Goods: BoP (SA, yoy % growth)	Haver				✓
s117	Brazil	Brazil: Terms of Trade (yoy % growth)	CEIC				✓
s120	Germany	Germany: Terms of Trade (yoy % growth)	CEIC				✓
s123	Italy	Italy: Terms of Trade (yoy % growth)	CEIC				✓
s124	Japan	Japan : Terms of Trade: All Commodities (yoy % growth)	Haver				✓
s125	Korea	Korea: Terms of Trade (yoy % growth)	CEIC				✓
s126	Mexico	Mexico: Terms of Trade (yoy % growth)	Haver				✓
s127	Russia	Russia: Terms of Trade (yoy % growth)	Haver				✓
s129	South Africa	South Africa: Terms of Trade: sa: Excluding Gold (yoy % growth)	Haver				✓
s130	Turkey	Turkey: Terms of Trade (yoy % growth)	Haver				✓
s131	UK	UK: Terms of Trade (yoy % growth)	CEIC				✓
s132	US	US: Terms of Trade: All Imports and exports (yoy % growth)	Haver				✓
s133	EU	EU: Terms of Trade EU 27: ACP (yoy % growth)	Haver				✓
Short-Term Interest Rates							
s134	Argentina	Argentina: Interest Rates: Savings Deposits 30-59 Days (% per annum)	Haver				✓
s135	Australia	Australia: BBA: 3-Month London Interbank Offered Rate: Based on AS (% ,AVG)	Haver				✓
s136	Brazil	Brazil: Short-term interest rate	Haver				✓
s137	Canada	Canada: Treasury Bills: 3-Months (AVG, %)	Haver				✓
s138	France	France: Treasury Bills, Bid Rate: 3-Month (AVG, %)	Haver				✓
s139	Germany	Germany: 3-Month Interbank Offered Rate {FIBOR} (%)	Haver				✓
s140	India	IN: Treasury Bills: Cut Off Yield: Auction: 3 Months (% pa)	CEIC				✓
s142	Italy	Italy: Interbank Rate: 3-Month (EOP, %)	Haver				✓
s143	Japan	JP: Financing Bills: Rate: 3 Months (% pa)	Haver				✓
s145	Mexico	Mexico: 91-Day Treasury Certificates (%)	Haver				✓
s148	South Africa	South Africa: Treasury Bill Tender Rate, 91-Days (Avg, %)	CEIC				✓
s149	Turkey	Turkey: Interest Rates: 3 Month Time Deposits (% p.a.)	Haver				✓
s150	UK	UK: Sterling Interbank Lending Rate, 3-months(AVG, %)	Haver				✓
s151	US	US: Short Term Interest Rate: Month End: Treasury Bills: 3 Months (% pa)	Haver				✓
s152	EU	Euro Area 11-17: 3-Month Deposits (%)	CEIC				✓
Bond Spreads							
s154	Australia	Australia: Bond Spread: Treasury Bonds: 10 - 2 Years (AVG, % p.a.)	Haver				✓
s156	Canada	Canada: Bond Spread: (10-Year & Over -- 1 to 3 year) Bond Yield Average (%)	Haver				✓
s158	Germany	Germany: Bond Spread: Gov Bond Yields: Ave Resid Maturity: (9 to 10 -- 2 to 3 Years) (%)	Haver				✓
s159	India	IN: Bond Spread: Government Securities Yield: (10 -- 2) Years (% pa)	CEIC				✓
s161	Italy	IT: Bond Spread: Government Treasury Bonds Yield: 10 -- 3 Year (% pa)	CEIC				✓
s162	Japan	Japan: Bond Spread: Benchmark Government Bond Yield: 10 -- 2 Year (AVG, % p.a.)	Haver				✓
s163	Korea	KR: Bond Spread: Bond Yield: Month Avg: Treasury Bond: 10 -- 1 Yr Maturity (% pa)	CEIC				✓
s167	South Africa	ZA: Bond Spread: Government Bonds Yield: Monthly Avg: 10 -- 0 to 3 Years (% p.a.)	CEIC				✓
s169	UK	UK: Generic Bond Spread: 10Y -- 2Y	Bloomberg				✓
s170	US	US: Bond Spread: 10 -- 2-Year Treasury Note Yield at Constant Maturity (% p.a.)	CEIC				✓
s171	EU	EU: Generic Bond Spread: 10Y -- 2Y	Bloomberg				✓

Series	Country	Descriptor	Source	Transformations			
				D.LOG of seasonally adjusted series	D.LOG (series already seasonally adjusted by source)	Seasonal adjustment of level series	No transformation
Exchange Rate							
s172	Argentina	Argentina: Exchange Rate (NC/USD)	INS	✓			
s173	Australia	Australia: Exchange Rate (NC/USD)	INS	✓			
s174	Brazil	Brazil: Exchange Rate (NC/USD)	INS	✓			
s175	Canada	Canada: Exchange Rate (NC/USD)	INS	✓			
s176	France	France: Exchange Rate (NC/USD)	INS	✓			
s177	Germany	Germany: Exchange Rate (NC/USD)	INS	✓			
s178	India	India: Exchange Rate (NC/USD)	INS	✓			
s179	Indonesia	Indonesia: Exchange Rate (NC/USD)	INS	✓			
s180	Italy	Italy: Exchange Rate (NC/USD)	INS	✓			
s181	Japan	Japan: Exchange Rate (NC/USD)	INS	✓			
s182	Korea	Korea, Republic of: Exchange Rate (NC/USD)	INS	✓			
s183	Mexico	Mexico: Exchange Rate (NC/USD)	INS	✓			
s184	Russia	Russian Federation: Exchange Rate (NC/USD)	INS	✓			
s185	Saudi Arabia	Saudi Arabia: Exchange Rate (NC/USD)	INS	✓			
s186	South Africa	South Africa: Exchange Rate (NC/USD)	INS	✓			
s187	Turkey	Turkey: Exchange Rate (NC/USD)	INS	✓			
s188	UK	United Kingdom: Exchange Rate (NC/USD)	INS	✓			
s190	EU	Euro Area: Exchange Rate (NC/USD)	INS	✓			
Loans and Credit							
s192	Australia	Australia: Credit including Securitized Housing Loans (billion NC)	Haver	✓			
s193	Brazil	BR: Loans: Financial System (billion NC)	CEIC	✓			
s194	Canada	Canada: Business & Household Credit (billion NC)	Haver	✓			
s195	France	France: Total Outstanding Loans by Monetary & Finan Inst (billion NC)	Haver	✓			
s196	Germany	DE: Loans: MFIs: Domestic Enterprises & Household (billion NC)	Haver	✓			
s197	India	IN: CS: Domestic Credit (billion NC)	CEIC	✓			
s200	Japan	JP: Loans & Discounts: FI: Total (billion NC)	CEIC	✓			
s201	Korea	KR: Loans of Commercial and Specialized Banks (CSB): Total (billion NC)	CEIC	✓			
s202	Mexico	MX: Commercial Banks: Outstanding Loan: Private Sector (billion NC)	CEIC	✓			
s203	Russia	Russia: Loans in Rubles and FC (billion NC)	Haver	✓			
s205	South Africa	ZA: Banks: Assets: Deposits, Loans & Advances (billion NC)	CEIC	✓			
s206	Turkey	TR: Domestic Loans (billion NC)	CEIC	✓			
s207	UK	UK: Bank Lending: GBP and Foreign Currency (billion NC)	Haver	✓			
s208	US	US: Bank Credit: All Commercial Banks (billion NC, SA)	Haver		✓		
s209	EU	EU: MFIs Loans: Outstanding: Non Financial Sector (billion NC)	CEIC	✓			
CPI							
s210	Argentina	AR: Consumer Price Index (2010 = 100)	CEIC	✓			
s211	Australia	Australia: CPI (Market Prices): Total excl Volatile Items (NSA) (2010 = 100)	Haver	✓			
s212	Brazil	BR: INPC: General (2010 = 100)	CEIC	✓			
s213	Canada	Canada: CPI: All Items (SA) (2010 = 100 SA)	Haver		✓		
s214	France	FR: Consumer Price Index (CPI) (2010 = 100)	CEIC	✓			
s215	Germany	DE: Consumer Price Index (CPI): Overall (2010 = 100)	CEIC	✓			
s218	Italy	IT: Consumer Price Index: (2010 = 100)	CEIC	✓			
s219	Japan	JP: Consumer Price Index (2010 = 100)	CEIC	✓			
s220	Korea	KR: Consumer Price Index (2010 = 100)	CEIC	✓			
s221	Mexico	MX: Consumer Price Index (2010 = 100)	CEIC	✓			
s222	Russia	Russia: Consumer Price Index (2010 = 100)	Haver	✓			
s223	Saudi Arabia	SA: Cost of Living Index (2010 = 100)	CEIC	✓			
s226	UK	UK: UK: Harmonized Index of Consumer Price (HICP) (2010 = 100)	CEIC	✓			
s227	US	US: Consumer Price Index: Urban (2010 = 100)	CEIC	✓			
s228	EU	EU: Consumer Price Index: sa (2010 = 100 SA)	CEIC		✓		
s229	Argentina	AR: Producer Basic Price Index (2010 = 100)	CEIC	✓			
PPI							
s230	Australia	Australia: Price index: Preliminary commodities: Total (2010 = 100)	Haver	✓			
s231	Brazil	BR: Broad Producer Price Index: FGV: IPA-M (2010 = 100)	CEIC	✓			
s232	Canada	Canada: Raw Materials Purchase Price Index (NSA) (2010 = 100)	Haver	✓			
s234	Germany	DE: Producer Price Index (PPI) (2010 = 100)	CEIC	✓			
s238	Japan	JP: Corporate Goods Price Index (CGPI): Domestic: All Commodities (2010 = 100)	CEIC	✓			
s239	Korea	KR: Producer Price Index: All Commodities and Services (2010 = 100)	CEIC	✓			
s240	Mexico	MX: Producer Price Index (2010 = 100)	CEIC	✓			
s241	Russia	Russia: PPI (2010 = 100)	GSTS	✓			
s243	South Africa	ZA: Production Price Index (PPI-00): Domestic Output (DO) (2010 = 100)	CEIC	✓			
s245	UK	UK: PPI: Input: Net Sector: All Products (2010 = 100)	CEIC	✓			
s246	US	US: PPI: Intermediate Materials (IM) (2010 = 100)	CEIC	✓			
s247	EU	EU: PPI: EU 27: Industry: excl Construction (2010 = 100)	CEIC	✓			
Employment							
s248	Argentina	Argentina: Urban Employed (Thousand)	Haver	✓			
s249	Australia	Australia: No of Employed (Thousand)	IFS	✓			
s251	Canada	Canada: Employment: Both Sexes, 15 Years & Over (NSA, Thousand)	Haver	✓			
s252	France	France: Total Employment: Total (SA, Thousand)	Haver		✓		
s253	Germany	DE: Employment: Germany (Person thousand)	CEIC	✓			
s256	Italy	Italy: Total Employment: Total Economy (NSA, Thousand)	Haver	✓			
s257	Japan	JP: Employment: Total (Person thousand)	CEIC	✓			
s258	Korea	KR: Employment (Person thousand)	CEIC	✓			
s260	Russia	Russia: Labor Market: Employment (NSA, Thousand)	Haver	✓			
s264	UK	UK: Employment: sa: Total (Person thousand)	CEIC	✓			
s265	US	US: Employment (Person thousand)	CEIC	✓			
s266	EU	EU: Unemployment: EU 27 (Person thousand)	Haver	✓			

Series	Country	Descriptor	Source	Transformations			
				DLOG of seasonally adjusted series	DLOG (series already seasonally adjusted by source)	Seasonal adjustment of level series	No transformation
Stock Exchange Index							
s267	Argentina	Argentina: Argentina Merval Index	Haver	✓			
s268	Australia	Australia: All Ordinaries Index	Haver	✓			
s269	Brazil	Brazil: Brazil Bovespa Index	Haver	✓			
s270	Canada	Canada: S&P/Tsx Composite Index	Haver	✓			
s271	France	France: Cac 40 Index	Haver	✓			
s272	Germany	Germany: Dax Index	Haver	✓			
s273	India	India: Bse Sensex 30 Index	Haver	✓			
s274	Indonesia	Indonesia: Jakarta Composite Index	Haver	✓			
s275	Italy	Italy: Dj Italy Stock Index	Haver	✓			
s276	Japan	Japan : Nikkei 225	Haver	✓			
s277	Korea	Korea: Mexico Ipc Index	Haver	✓			
s278	Mexico	Mexico: Micev Index	Haver	✓			
s279	Russia	Russia: Tadawul All Share Index	Haver	✓			
s280	Saudi Arabia	Saudi Arabia: Ftse/Jse Africa Top40 Ix	Haver	✓			
s281	South Africa	South Africa: Kospil Index	Haver	✓			
s282	Turkey	Turkey: Ise National 100 Index	Haver	✓			
s283	UK	UK: Ftse 100 Index	Haver	✓			
s284	US	US: S&P 500 Index	Haver	✓			
s285	EU	EU: Ftseurofirst 300 Index	Haver	✓			
Money Supply M2							
s287	Australia	Australia: Broad Money (Millions, National Currency)	IFS	✓			
s288	Brazil	Brazil: Money Supply, M2 (Millions, National Currency)	Haver	✓			
s289	Canada	Canada: M2 {Gross} (Millions, National Currency)	Haver	✓			
s290	France	France: Money Supply: M2 (Millions, National Currency)	Haver	✓			
s291	Germany	Germany: Money Supply: M2 (Millions, National Currency)	Haver	✓			
s292	India	India: Money Supply: M2 (Millions, National Currency)	Haver	✓			
s293	Indonesia	Indonesia: Broad Money: Broad Money [M2] (Millions, National Currency)	Haver	✓			
s294	Italy	Italy: Money Supply, M2 (Millions, National Currency)	Haver	✓			
s295	Japan	Japan : M2 (Period Average) (Millions, National Currency)	IFS	✓			
s296	Korea	Korea: Money Supply: M2 (Millions, National Currency)	Haver	✓			
s297	Mexico	Mexico: M2 (Millions, National Currency)	IFS	✓			
s298	Russia	Russia: Money Supply ["National Definition"]: M2(Millions, National Currency)	Haver	✓			
s299	Saudi Arabia	Saudi Arabia: Money Supply: M2(Millions, National Currency)	Haver	✓			
s300	South Africa	South Africa: Monetary Aggregates: M2 (Millions, National Currency)	Haver	✓			
s301	Turkey	Turkey: Money Supply: M2(Millions, National Currency)	Haver	✓			
s302	UK	UK: Money Supply M2(Millions, National Currency)	CEIC	✓			
s303	US	Money Stock: M2(Millions, National Currency)	Haver	✓			
s304	EU	EA 11-17: ECB Money Supply: M2 (Millions, National Currency)	Haver	✓			
Goods and Services Balance							
s305	Argentina	Argentina: Balance of Payments: Goods & Services Balance	Haver			✓	
s306	Australia	Australia: BOP: Goods and Services Trade Balance	Haver			✓	
s307	Brazil	Brazil: BOP: Current Account: Goods & Services Balance	Haver			✓	
s308	Canada	Canada: Current Account: Goods and Services Balance	Haver			✓	
s309	France	France: BOP: Current Acct: Goods & Services Balance	Haver			✓	
s310	Germany	Germany: BOP: Current Account: Balance of Trade: Goods & Services	Haver			✓	
s311	India	India: BOP: Goods and Services	Haver				✓
s312	Indonesia	Indonesia: BOP: Trade in Goods & Services: Balance	Haver			✓	
s313	Italy	Italy: BOP: Current Account: Goods & Services	Haver			✓	
s314	Japan	Japan: BOP: Current Account Balance: Goods And Services	Haver			✓	
s315	Korea	Korea: BOP: Trade in Goods & Services: Balance	Haver			✓	
s316	Mexico	Mexico: BOP: Current Acct, Goods & Services	Haver			✓	
s317	Russia	Russia: BOP: Balance on Goods & Services	Haver			✓	
s319	South Africa	South Africa: BOP: Goods & Services Balance	Haver			✓	
s320	Turkey	Turkey: BOP: Balance of Goods & Services	Haver			✓	
s321	UK	U.K.: Current Account: Trade Balance: Goods and Services	Haver			✓	
s322	US	Trade Balance: Goods and Services, BOP Basis	Haver				✓
s323	EU	EA 17: BOP: Curr Acct: Net: Goods & Services	Haver			✓	
World Price Indicators							
s324	World	World: Consumer Prices (2005=100, NSA)	IFS	✓			
s326	World	World: Avg Crude Price of UK Brt Lt/Dubai Med/Alaska NS heavy (US\$/Bbl)	IFS	✓			
s327	World	World: Commodity Price: Sugar, Caribbean {NY} (US cts/lb)	IFS	✓			
s328	World	World: Commodity Price: Linseed Oil, Any Origin (US\$/MT)	IFS	✓			
s329	World	World: Commodity Price Index: All Commodities (2005=100)	IFS	✓			
s330	World	World: Commodity Price Index: Food (2005=100)	IFS	✓			
s331	World	World: Commodity Price Index: Beverages (2005=100)	IFS	✓			
s332	World	World: Commodity Price Index: Agricultural Raw Materials (2005=100)	IFS	✓			
s333	World	World: Commodity Price Index: Metals (2005=100)	IFS	✓			
s334	World	World: Non-fuel Primary Commodities Index (2005=100)	IFS	✓			
s335	World	World: Commodity Price Index: Linseed Oil {Any Origin} (2005=100)	IFS	✓			
s336	World	World: Spot Price Idx of UK Brt Lt/Dubai Med/Alaska NS heavy (2005=100)	IFS	✓			
s337	World	World: Commodity Price Index: Sugar, Caribbean {NY} (2005=100)	IFS	✓			
s344	Canada	Canada: Aluminum Canada/Uk	IFS	✓			
s345	Australia	Australia: Coal Australia Index	IFS	✓			
s346	United Kingdom	United Kingdom: Copper Uk (London)	IFS	✓			
s347	United Kingdom	United Kingdom: Gold London Av 2Nd Fix	IFS	✓			
s348	Brazil	Brazil: Iron Ore Brazil (N.Sea.Ports)	IFS	✓			
s349	United Kingdom	United Kingdom: Lead U.K. (London)	IFS	✓			
s350	United States	United States: Natural Gas Index - Us	IFS	✓			
s351	Canada	Canada: Nickel Canada Can/Ports	IFS	✓			
s352	World	World: Averige Crude Price: 3 Spot Price Index	IFS	✓			
s353	United States	United States: Texas Spot Price Index	IFS	✓			
s354	Thailand	Thailand: Rice Thailand (Bangkok)	IFS	✓			
s355	Malaysia	Malaysia: Rubber Malaysia(Singapore)	IFS	✓			
s356	United States	United States: Silver U.S.(New York)	IFS	✓			
s357	United States	United States: Soybeans Us(Rotterdam)	IFS	✓			
s358	United States	United States: Soybean Oil Us(RotDam)	IFS	✓			
s359	United Kingdom	United Kingdom: Tin All Origins(London)	IFS	✓			
s360	United Kingdom	United Kingdom: Zinc U.K.(London)	IFS	✓			

Series	Country	Descriptor	Source	Transformations			
				DLOG of seasonally adjusted series	DLOG (series already seasonally adjusted by source)	Seasonal adjustment of level series	No transformation
China Indicators							
s361	China	China: Index of Gross Value Added in 1990 Prices	Haver	✓			
s362	China	China,P.R.: Mainland: Exports to World (USD mn)	DOTS	✓			
s363	China	China,P.R.: Mainland: Imports from World (USD mn)	DOTS	✓			
s365	China	CN: Nominal Lending Rate: Short Term: 6 Month (% pa)	CEIC				✓
s367	China	China,P.R.: Mainland: Exchange Rate (NC/USD)	INS	✓			
s368	China	CN: Loan (RMB bn)	CEIC	✓			
s369	China	CN: Consumer Price Index	CEIC	✓			
s370	China	CN: Producer Price Index	CEIC	✓			
s371	China	China: Urban Employment: Total (NSA, Thous)	Haver	✓			
s372	China	China: Index: Shanghai Stock Exchange: Composite	CEIC	✓			
s373	China	China: Money Supply: M2 (SA, Mil Yuan)	Haver		✓		
s374	China	CHN: BoP: Service & Goods	Haver				✓
s375	China	CN: Trade Balance (DOTS, USD mn)	DOTS				✓
s376	China	National Accounts, Private Final Consumption Expenditure, Real	CEIC	✓			
s377	China	National Accounts, Gross Fixed Capital Formation, Private, Real	CEIC	✓			
s378	China	National Accounts, Gross Fixed Capital Formation, Private, Private Corporations, Real	CEIC	✓			
s379	China	National Accounts, GFCF, Private, Households Incl. Private Non-profit Inst., Real	CEIC	✓			
s380	China	CN: REAL Fixed Asset Investment (RMB mn)	CEIC	✓			
s385	China	CN: Exports: Primary Product	CEIC	✓			
s386	China	CN: Exports: Primary Product: Food and Live Animal	CEIC	✓			
s387	China	CN: Exports: Primary Product: Beverage and Tobacco	CEIC	✓			
s388	China	CN: Exports: Primary Product: Crude Material, Inedible, Except Fuel	CEIC	✓			
s389	China	CN: Exports: Primary Product: Mineral Fuel, Lubricant & Related Material	CEIC	✓			
s390	China	CN: Exports: Primary Product: Animal and Vegetable Oil, Fat and Waxes	CEIC	✓			
s391	China	CN: Exports: Manufacture	CEIC	✓			
s392	China	CN: Exports: Manufacture: Chemical and Related Product	CEIC	✓			
s393	China	CN: Exports: Manufacture: Manufactured Goods	CEIC	✓			
s394	China	CN: Exports: Manufacture: Machinery and Transport Equipment	CEIC	✓			
s395	China	CN: Exports: Manufacture: Misc Mfg Article	CEIC	✓			
s396	China	CN: Exports: Manufacture: Unclassified Goods	CEIC	✓			
s397	China	CN: Imports: Primary Product	CEIC	✓			
s398	China	CN: Imports: Primary Product: Food and Live Animal	CEIC	✓			
s399	China	CN: Imports: Primary Product: Beverage and Tobacco	CEIC	✓			
s400	China	CN: Imports: Primary Product: Crude Material, Inedible, Except Fuel	CEIC	✓			
s401	China	CN: Imports: Primary Product: Mineral Fuel, Lubricant & Related Material	CEIC	✓			
s402	China	CN: Imports: Primary Product: Animal and Vegetable Oil, Fat and Waxes	CEIC	✓			
s403	China	CN: Imports: Manufacture	CEIC	✓			
s404	China	CN: Imports: Manufacture: Chemical and Related Product	CEIC	✓			
s405	China	CN: Imports: Manufacture: Manufactured Goods	CEIC	✓			
s406	China	CN: Imports: Manufacture: Machinery and Transport Equipment	CEIC	✓			
s407	China	CN: Imports: Manufacture: Misc Manufactured Article	CEIC	✓			
s408	China	CN: Imports: Manufacture: Unclassified Goods	CEIC	✓			
s409	China	CN: Commodity Bldg Selling Price: Residential (RMB/Sq m)	CEIC	✓			
s416	China	CN: Effective Exchange Rate Index: BIS: Real (2010=100)	CEIC		✓		
s417	China	CN: Effective Exchange Rate Index: BIS: Nominal (2010=100)	CEIC		✓		
s419	China	CN: Transaction Price: Round Steel: 16mm, HPB235 (RMB/Ton)	CEIC	✓			
s420	China	CN: Transaction Price: Electrolyse Copper, No 1 (RMB/Ton)	CEIC	✓			
s421	China	CN: Transaction Price: Aluminum: AOO (RMB/Ton)	CEIC	✓			
s422	China	CN: Transaction Price: Zinc, No 1 (RMB/Ton)	CEIC	✓			
s423	China	CN: Import Price: Iron Ore & Concentrate (USD/Ton)	CEIC	✓			
s425	China	CN: Service Price: 36 City Avg: Electricity: for Resident: 220v (RMB/100KWH)	CEIC	✓			
s426	China	CN: Service Price: 36 City Avg: Pipe Gas: for Resident (RMB/Cub m)	CEIC	✓			
s436	China	CN: Import Price: Crude Oil (USD/Ton)	CEIC	✓			
s437	China	CN: Export Price: Crude Oil (USD/Ton)	CEIC	✓			
s438	China	CN: FAI: Primary Industry (RMB mn)	CEIC	✓			
s439	China	CN: FAI: Secondary Industry (SI) (RMB mn)	CEIC	✓			
s443	China	CN: FAI: SI: Construction (RMB mn)	CEIC	✓			
s444	China	CN: FAI: Tertiary Industry (RMB mn)	CEIC	✓			
s464	China	CN: Floor Space Started: Commodity Bldg (CB) (Sq meter th)	CEIC	✓			
s468	China	CN: Floor Space Completed: Commodity Bldg (CB) (Sq meter th)	CEIC	✓			
s469	China	CN: Floor Space Completed: CB: Residential (Sq meter th)	CEIC	✓			
s472	China	CN: Floor Space Sold: (Sq meter th)	CEIC	✓			
s473	China	CN: Floor Space Sold: Residential (Sq m th)	CEIC	✓			
s481	China	CN: Land Area Purchased: (Sq meter th)	CEIC	✓			
s483	China	CN: Real Estate Inv: (RMB mn)	CEIC	✓			
s484	China	CN: Real Estate Inv: Residential Building (RMB mn)	CEIC	✓			
s490	China	CN: Real Retail Sales (2000=base year) Billion RMB	CEIC	✓			