

## The Relationship Between Financial Condition and Business Cycle in Mongolia

Gan-Ochir Doojav\* 

*The Bank of Mongolia*

doojav\_ganochir@mongolbank.mn

Munkhbayar Purevdorj 

*The Bank of Mongolia*

p.munkhbayar@mongolbank.mn

This paper examines the interactions between financial conditions and business cycles in Mongolia, a small open economy, heavily depending on commodity exports. We construct two financial conditions indexes based on the reduced form IS model and the vector autoregression (VAR) model as surveillance tools to quantify the degree of the financial conditions. We find that real short-term interest rate and real effective exchange rate gap get a higher weight in the FCIs. Both business and financial cycles are often more pronounced in Mongolia, and financial condition is dependent of the financial and monetary policies in place. The analysis of the predictive power of the FCIs for business cycles shows that they have predictive information for the near-term economic activities. FCIs are also helpful in signaling inflation turning points.

*Keywords:* Financial Condition Index, Business Cycle, Leading Indicator, Weighted-sum Approach, Mongolia

*JEL Classification:* C32, E17, E44

### I. INTRODUCTION

The recent global financial crisis (GFC) has emphasized an importance of financial markets on the real economic activity. Financial conditions have an important effect

\* Corresponding Author: Gan-Ochir Doojav, Chief Economist, The Bank of Mongolia, Baga toiruu 3, Ulaanbaatar 46, 15160, Mongolia, Tel: +976-11-318304, Fax: +976-11-311471, E-mail doojav\_ganochir@mongolbank.mn. The authors would like to thank three anonymous referees for their comments and suggestions, which helped to improve the manuscript. The opinions expressed herein are those of the authors and do not necessarily reflect the official views of Bank of Mongolia.

on business cycles because they reflect both the markets' expectations and the feedback of past and current economic activities. In particular, capital flows and windfall export revenues can deliver substantial benefits, but they have the potential to contribute to a buildup of systemic financial risk. The development of macroprudential policies are helping to strengthen the resilience of financial systems to external shocks. The implementation of macroprudential policies has only cemented financial conditions indexes (FCIs) as necessary tools in the policy makers' toolkit (Gómez et al., 2011). Since a FCI combines a wide range of financial and macroeconomic variables, the index also can be used as a leading indicator for short-term financial and economic activities. However, some economists argue that for a small open economy, heavily dependent on mineral exports as well as being financially underdeveloped, financial conditions do not predict, but only reflect business cycles as economic activities are significantly affected by ups and downs of global commodity prices. Therefore, it is important to empirically analyze the role of financial conditions in business cycle fluctuations for the economies.

This paper examines the interactions between financial conditions and business cycles in Mongolia, a small open economy heavily depending on commodity exports. To measure financial conditions, we construct two financial conditions indexes (FCI) based on the weights of the respective asset prices estimated from reduced-form IS model and the vector auto-regression (VAR) model proposed by Goodhart and Hofmann (2001). Mongolia is facing with challenges in transforming its resource wealth into assets that support sustainable growth and strengthening resilience of the economy. Hence, evidence from the Mongolian economy would be of high relevance determining the optimal policy to maintain macroeconomic and financial stability for other resource-rich developing countries. This paper extends to the literature by providing evidence on the role of the financial condition in the business cycle fluctuations for commodity-abundant developing countries. As far as we are aware, studies that analyze such issue are rare in the literature.

In recent years, many central banks and scholars have been trying to develop FCIs to respectively measure the aggregate financial conditions. The literature review (i.e., Mayes and Virén, 2001; Goodhart and Hofmann, 2001; Lack, 2003; Gauthier et al., 2004) suggests that short-term interest rate (the real 3 month market rate), the real effective exchange rate, the real stock price (or market capitalization to GDP ratio), and the real house/property price are mostly used in calculating FCIs. A wide range of methodologies for constructing the FCIs have been developed over time. The most

popular approaches are the weighted-sum approach and the principal component approach. In this paper, we use the first approach, in which the weights of each financial indicator are assigned according to the estimated impact on real GDP growth in structural macroeconomic models or a vector autoregressive (VAR). For instance, Goodhart and Hoffman (2001) construct FCIs for G7 countries using three approaches: an IS-curve-based model, impulse-response functions, and factor analysis. They find that house and share prices have a substantial weight and the derived FCIs contain useful information about future inflationary pressures. Using similar methodologies, Gauthier et al. (2004) construct FCIs for Canada and find that FCIs are better than monetary condition indexes (MCIs) in explaining and predicting near-term GDP growth. The second approach is the principal component approach, in which the FCI reflects a common factor, extracted from a group of financial variables and captures the greatest common variation among them. For instance, Matheson (2011) uses a wide range of financial indicators and a dynamic factor model in constructing FCIs for the United States and the euro area. He finds that the FCIs can provide not only summary measures of the financial conditions, but also useful information about the evolution of economic activity. Gumata et al. (2012) use the principal component approach proposed by Hatzius et al. (2010) in constructing FCIs for South Africa. They find that the calculated FCIs seem to have powerful predictive information for the near-term GDP growth (up to four quarters).

Borio (2014) finds five stylized empirical features of the financial cycle: (i) the cycle is best captured by the joint behavior of credit and property prices, (ii) it is much longer and has a much larger amplitude than the business cycle, (iii) it is closely associated with systemic banking crises, which tend to occur close of its peak, (iv) It permits the identification of the risks of future financial crises in real time and with a good lead, and (v) it is highly dependent of the financial, monetary and real-economy policy regimes in place. By analyzing the interaction between business and financial cycles for 44 countries, Claessens et al. (2012) find that (i) recessions associated with financial disruption episodes are often longer and deeper than other recessions, (ii) financial cycles tend to be longer, deeper, and sharper than business cycles, and (iii) both business and financial cycles are often more pronounced in emerging markets than those in advanced economies.

The paper is organized as follows. Section 2 provides the country background. Section 3 describes the reduced-form IS curve method and the impulse response method of the weighted sum approach and presents the calculated FCIs. Section 4

presents the FCIs and examines the interactions between financial conditions and business cycles. Finally, section 5 concludes with policy implications.

## II. THE COUNTRY BACKGROUND

Mongolia is a resource rich country and its narrow economic base has left the country highly vulnerable to external shocks- minerals account for 90 percent of all exports (Li et al., 2017). Similar to the real sector, the bank-centered financial sector is dependent on cycles of capital flow driven by the mining sector. Thus it is no coincidence that economic boom-bust cycle driven by the commodity prices are often followed by credit cycles in the financial sector.

While the economic transition of Mongolia started in 1990, the extraction of mineral resources in recent years has been driving the structural change of the economy with a shift in economic production from agriculture to mining (Maino et al., 2013). Currently, the mining sector accounts for 20 per cent of the economy, and mineral exports account for up to 90 per cent of total exports. Real gross domestic product (GDP) growth in Mongolia averaged 7 per cent annually over the period 2000-2017 supported by a large stock of resources, a large amount of foreign direct investment (FDI) inflows to the mining sector and buoyant global commodity market conditions. Because of the country's narrow economic base, it is highly vulnerable to external shocks (i.e., commodity price fluctuations and volatility in FDI), and the lack of diversification has made the economy prone to repeated boom-bust cycles. Large capital flows and volatile commodity prices have led to greater macroeconomic volatility, real exchange rate appreciation, reduced external competitiveness and the build-up of balance sheet vulnerabilities. Mongolia's fiscal framework is designed to prevent such procyclicality, however it was essentially set aside in recent years.

Mongolia has a relatively closed, bank-based financial system, which is growing rapidly. Currently, 14 registered commercial banks account for 95 percent of the total financial system assets and the ratio of total bank loans to GDP is 52 percent. Though foreign banks are not present in Mongolia, overseas financial institutions hold certain shares of domestic bank equities and have established their representative offices. Hence, banks play vital role in money creation and in the transmission of monetary policy measures. Banking sector lending is highly concentrated in mining, construction, trading, and household sectors as there are few investment opportunities available domestically. The banking sector is characterized by extremely short maturities on

financial liabilities. Thus the term for business loan is short (less than two years). Volatile capital flows and domestic liability dollarization lead to exchange rate risk on banks or their customers because of underdeveloped foreign exchange hedging. Banks largely exposed to the public sector (one quarter of bank assets are in public sector securities which currently pay double-digit interest rates) and foreign currency movements (foreign currency deposits are 31 percent of total and 17 percent of GDP while foreign currency loans are 21 percent of total and 10 percent of GDP). Banks have relatively low capital compared to assets, and are highly leveraged. Given the history of banks' failures, a change in public confidence for a bank quickly triggers bank runs. Accordingly, the banking sector is more likely to be subjected to domestic and external shocks.

Currently, structural reforms are underway to lay the foundations for long-term growth and build resilience against the boom-bust cycle. The near-term objective is to strengthen the banking sector and enhance fiscal policy making. The task to strengthen the banking system, a crucial part of the program to ensure that the banks can support sustainable and inclusive economic growth, is underway. On the fiscal side, steady progress is made in strengthening tax administration, tax policy, and budgetary controls by establishing a Fiscal Council. These adjustments and structural reforms are expected to stabilize the economy and lay the basis for sustainable and inclusive growth in the long run. Fiscal consolidation would put public debt on a declining path over the course of the program, thus leave room for the banking sector to extend more credit to the private sector over time.

### III. MEASURING FCI: THE WEIGHTED SUM APPROACH

The FCI is an index that combines a wide range of high frequency financial variables to assess aggregate financial conditions in the economy (Ho and Lu, 2013). The FCI is defined as:

$$FCI_t = \sum_i w_i \hat{x}_{it} \quad (1)$$

where  $\hat{x}_{it} = (x_{it} - \bar{x}_{it})$  is the financial gap variables used in the FCI, including ex-post real short-term interest rate, the real effective exchange rate gap, the real bank loan gap and the real stock price index gap. The FCI in each period  $t$  is a weighted average of  $i$  different financial gap variables ( $\hat{x}_{it}$ ), and  $w_i$  denotes the relative weight

given to  $i$  variable.  $\bar{x}_{it}$  denotes the time-varying trend (or long-term equilibrium level). The financial variables used in the FCI calculation are measured as deviations from their time-varying trends ( $\hat{x}_{it}$ ). Some economists argue that for resource-rich economies, growth is heavily influenced by global commodity booms and busts, thus its trend would be generally hard to identify by only applying the Hodrick-Prescott (HP) filter. However, in this paper, we use the HP filter, widely used tool for economic research and policy analysis, in deriving the variables' time-varying trends because global commodity prices only affects the cyclical components and there is no already accepted and simple alternative way to measure the time-varying trends. Moreover, the existing literature on Mongolia shows that the business cycle obtained by the HP filter is in line with other measures such as Band-Pass and Kalman filters and historical economic performance.

As we use the weighted sum approach, the relative weight ( $w_i$ ) are derived from two methods such as the reduced-form IS curve framework and impulse-response functions of a VAR.

### *1. The reduced-form IS curve framework*

Under the framework, the relative weights are derived by using the sum of coefficients on lags of the variables. The advantage of deriving a FCI from a reduced-form model is that the effect of each potential transmission channel on the real economy can be identified under a sufficient number of identifications. Shocks that may have an impact on the economy such as external shocks, fiscal shocks, supply shocks and market sentiment, can be modelled in the framework. Although the framework is widely used in the construction of FCIs, it is subject to criticism that all explanatory variables cannot be exogenous to each other and to the real economy may lead to estimation bias and/or identification problem.

We adopt a framework similar to that proposed by Goodhart and Hofmann (2001), and the backward-looking IS curve is defined as follows:

$$\begin{aligned} \hat{y}_t = & \beta_0 + \sum_{k=1}^l \beta_k \cdot \hat{y}_{t-k} + \sum_{i=1}^{n1} \sum_{j=0}^{m1} \beta_{i,j} \cdot \hat{x}_{i,t-j} \\ & + \sum_{m=1}^{n2} \sum_{l=0}^{m2} \beta_{m,l} \cdot \hat{z}_{m,t-l} + \varepsilon_t \end{aligned} \quad (2)$$

where  $\hat{y}_t$  is the output gap, defined as difference between the real GDP and its potential (long-term equilibrium) level, calculated using the HP filter with a smoothing parameter of 1600,  $\hat{x}_i$  is the financial variables, and  $\hat{z}_m$  represents other explanatory variables including the natural logarithm of world market copper price and the Chinese economic growth rate.

We allow a lag structure in the IS curve to take into account the dynamics of those variables over time. The existing studies has shown that the backward-looking IS curve with a lag structure is empirically viable than the standard forward-looking IS curve. The dependent variable in the IS equation is chosen as the output gap instead of output growth because the growth is too volatile and the gap is good measure to capture the business cycle in Mongolia. As the economy is prone to external shocks, we include the external factors such as global commodity price and Chinese growth, which is the best proxy for export demand since 90 percent of total export is exported to China.

## 2. Impulse-response functions

The IS curve framework discussed above has assumed that the variables in the FCI are exogenous to output and to each other. A way to relax the assumption is to base the FCI weights on the impulse responses of a VAR in which all the variables are treated as endogenous. In particular, the relative weight of each variable ( $w_{i,t}$ ) is calculated based on the relative average impact of each chosen financial variables ( $\hat{x}_{i,t}$ ) on the output gap ( $\hat{y}_{i,t}$ ) over the following 10 quarters, the period of time over which policy action is thought to have its full impact on output. Moreover, the VAR-based construction with weight decided on 10-quarter averages of the impulse responses is more comparable with IS-curve based construction as weights reflect full ('long run' or 'cumulative') effects of the explanatory variables.

In the VAR, we include the set of variables: the output gap, the real short-term interest rate, the real effective exchange rate gap, the real bank loan gap and the real stock price index gap. Following Goodhart and Hofmann (2001), the shocks were identified using a standard Cholesky factorization, with the ordering as the output gap, the real effective exchange rate gap, real interest rate gap, the real bank loan gap and the real stock index gap.

In the following sections, we derive FCI weights based on reduced form estimates of coefficients in a simple aggregate demand (IS curve) and impulse responses from an identified VAR.

## IV. DATA AND EMPIRICAL RESULTS

### 1. Data

We use the quarterly data over the sample period 2001.Q1-2014.Q4. Monthly data is not used since GDP is announced on a quarterly basis. Real effective exchange rate, real bank loan, real short term interest rate (interbank market rate) and real stock price are obtained from the statistical bulletins of the Bank of Mongolia and National Statistical Office, while the Chinese growth rate is taken from the Chinese Statistical Office website. The world market copper price (spot copper price in the London Metal Exchange) is obtained from Bloomberg terminal. As there are strong seasonality in the GDP and the real bank loans, seasonal adjustment is made for the variables using the Census X-12 method before de-trending them.

### 2. FCI based on a reduced-form IS curve

Before estimating the reduced-form IS curve, it is important to determine the stationarity of the variables. As shown in the appendix, the Augmented Dickey-Fuller (ADF) unit root test suggests that the output gap ( $\hat{y}_t$ ), the real effective exchange rate gap ( $reer\_gap_t$ ), the real bank loan gap ( $rloan\_gap_t$ ) and the real short-term interest rate ( $rstir_t$ ) are stationary (i.e., I(0)), while the real stock price index gap ( $rspi\_gap_t$ ), the natural logarithm of the world market copper price ( $lncopp_t$ ) and the Chinese growth rate ( $chg_t$ ) are nonstationary, but integrated of order one (i.e., I(1)) at the 1 percent significance level. For the nonstationary variables, the first differenced variables are included in the IS curve estimation.

The four variables (real interest rate, real effective exchange rate, real bank loans, real stock price) are the standard variables used in the weighted-sum approach, and also available to observe in emerging and developing economies (see Goodhart and Hofmann, 2001; Zheng and Yu, 2014; Khundrakpam et al., 2017). Moreover, in the case of Mongolia, time series for other financial variables are short, which constraints to use them and to employ other methodologies such as principle component approach.

We estimate an augmented backward-looking IS curve including change in real stock price gap. In the specification, change in real stock price gap affects aggregate demand (output gap) through wealth effects. For instance, a positive change in real stock price gap may induce consumers and entrepreneurs to increase their consumption



and investment since it implies the expansion phase of stock price cycle in which the more wealth they can accumulate and easy to raise fund for investments. Another, more indirect wealth effect (i.e., financial accelerator mechanism) of real stock price movements operates through households' and firms' balance-sheets.

In the estimation, we use a general-to-specific modelling strategy- variables and their time lags are chosen based on their statistical significance. The estimation result of the IS curve is shown in the table 1. The residual diagnostic tests of the estimated equation cannot reject the null hypothesis of no serial correlation and no heteroskedasticity at the 5 percent significance level.

Table 1. Estimation of the Reduced-form IS Curve

Sample: 2001Q1-2014Q4	
$\hat{x}_{i,t}, \hat{z}_{i,t} \rightarrow \hat{y}_t$	
Variable	Coefficient
$rstir_{t-1}$	-0.19**
$reer\_gap_{t-1}$	-0.17***
$rloan\_gap_t$	0.10**
$rloan\_gap_{t-2}$	-0.06***
$\Delta rspi\_gap_{t-2}$	0.04**
$\Delta lncopp_t$	0.001**
$\Delta chg_{t-1}$	0.73***
Const.	0.03
$R^2$	0.45
$\bar{R}^2$	0.36
$\chi^2_{SC}$	0.49 [0.78]
$\chi^2_{HET}$	4.58 [0.10]

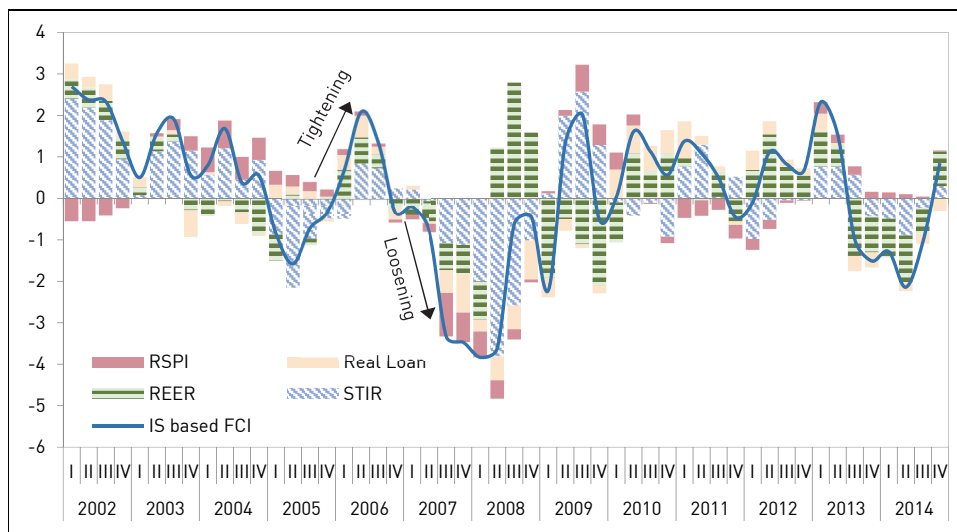
Notes: \*, \*\*, \*\*\* denotes statistical significance at 1% level, 5% level and 10% level, respectively. The Lagrange multiplier (LM) test is used for serial correlation (with a  $\chi^2$  distribution with 2 degree of freedom) and heteroskedasticity. Values in [ ] indicate p-values for the null hypotheses.

Explanatory variables except for the intercept in the estimated IS curve are estimated as statistically significant. A decrease in real interest rate leads to increases in private investment, household spending on durable goods, hereby pushes up the aggregate demand in the economy. The real exchange rate depreciation leads to an increase in the domestic demand (the net export), suggesting that the Marshall-Lerner condition holds in the case of Mongolia. As it is confirmed by the estimation, financial conditions (i.e., the real bank loan gap and real stock market price index gap) affect the economic activity. The Chinese growth rate has a strong effect on the Mongolian business cycle

as it is the main deterrents of the mining export demand. As expected, the commodity price positively affects the economic activity.

The sum of coefficients on lags of the variables is used as the relative weight in the FCI estimation. The estimated FCI and its decomposition are shown in Figure 1.

Figure 1. FCI Based on IS Curve and Its Decomposition



A downward trend of the FCI implies the loosening of financial conditions, while an increase in the FCI implies tighter financial conditions. The decomposition of the FCI shows that the changes in real short-term interest rate and the real exchange rate explain the movement of the FCI based on the reduced-form IS curve. The properties of the FCI and its linkage with the economy activity are discussed in Section 4.3.

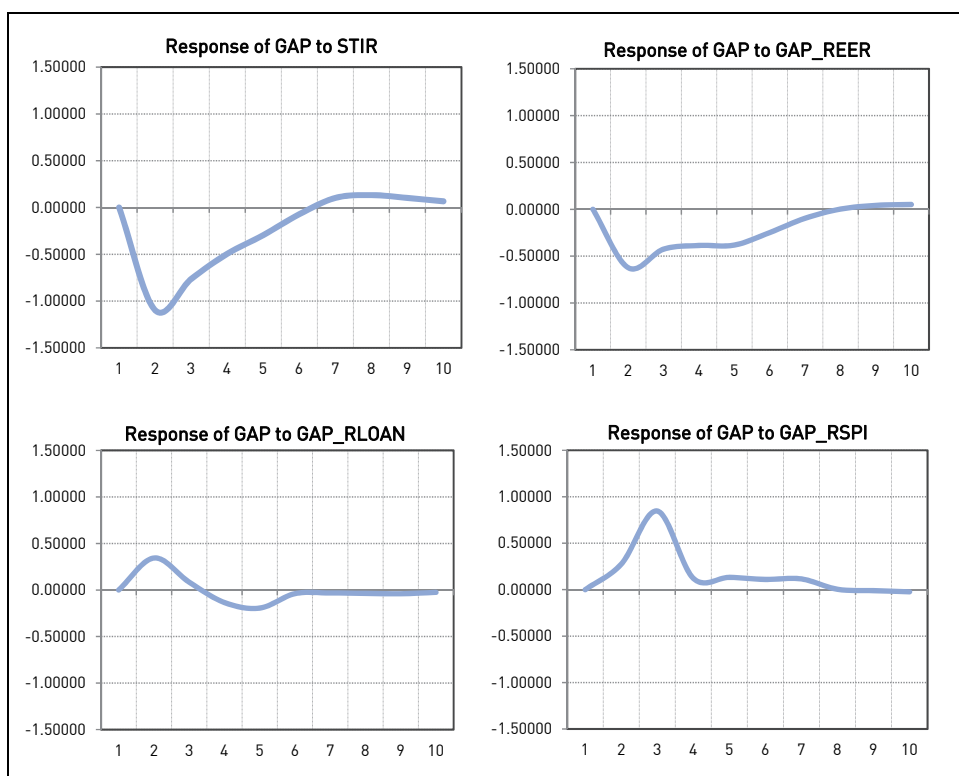
### 3. FCI based on impulse response functions

In order to specify properly the VAR model, a univariate unit roots and cointegration tests are conducted. The ADF test results are discussed in Section 4.1 and all variables except for the real stock price index gap are stationary (i.e.,  $I(0)$ ). Cointegration test proposed by Johansen and Juselius (1990) is a type of multivariate unit root test, and the test suggests that the variables included in the VAR do not have a unit root since number of cointegration is equal to the number of variables in the system (Gomes and

Paz, 2005). In particular, both Trace and Eigen-value tests indicates 5 cointegrating equations between these five variables at 5 percent significance level. The optimal lag length of the VAR is selected as 1 quarter suggested by both Akaike and Schwarz information criterions. The results shown in the appendix suggest to adopt a VAR(1) model with level variables.

The impulse response functions of the output gap to four structural shocks (i.e., shocks to real short term interest rate, real effective exchange rate gap, real loan gap, and real stock price gap) based on the Cholesky factorization are shown in Figure 2. The size of shock is one standard deviation of the financial variables.

Figure 2. Impulse Response Functions to Cholesky one S.D. Innovations

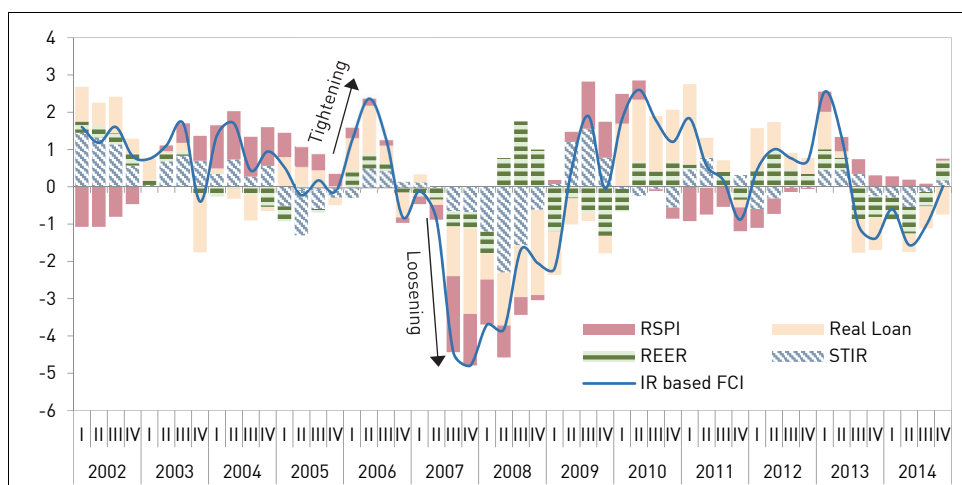


The response functions are consistent with the result of the estimated IS curve. In response to the positive real exchange rate gap shock (i.e., overvaluation of the exchange rate), the output gap falls after one quarter, and back to the equilibrium level

of output in seven quarters. A rise in the real interest rate leads to a fall in the output gap, and it takes more than 6 quarters to close the gap. As found in the estimation of the reduced-form IS curve, positive shocks to bank lending and stock market lift the real sector activity in the first two quarters.

FCI weights are measured as the average impulse responses of the output gap over ten quarters. The estimated FCIs and its decomposition are shown in Figure 3.

Figure 3. FCI Based on Impulse Response Functions and Its Decomposition



The movement of FCI based on impulse response functions is closer to the FCI based on the reduced-form IS curve.

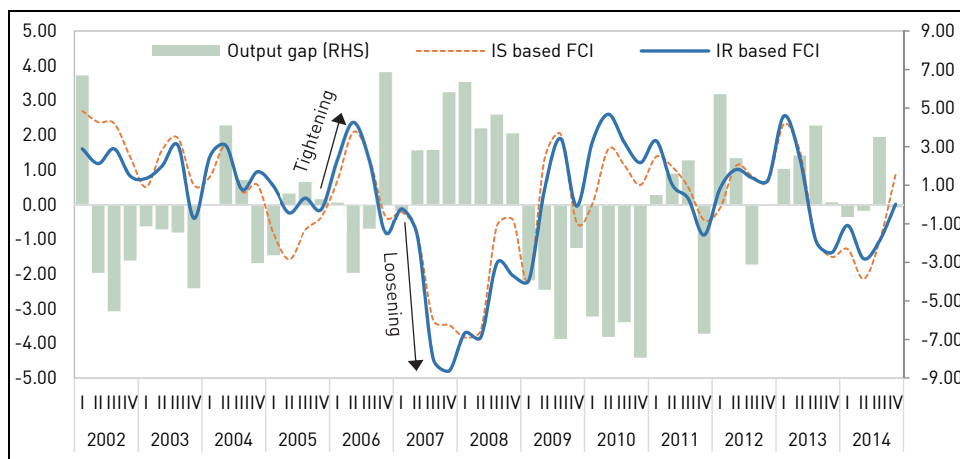
#### 4. The interactions between financial conditions and business cycles

The FCI based on impulse response functions (its standard deviation is 1.72) is more volatile compared to the FCI based on the IS curve (its standard deviation is 1.61). Generally, these FCIs move together and show similar turning points (Figure 4).

From Figure 4, it is clear that FCIs are negatively correlated with business cycle measured by the HP filtered output gap. As suggested by the literature, both business and financial cycles are often more pronounced in Mongolia. However, in contrast to the literature on advanced economies, there is no evidence that financial cycles tend to be longer, deeper, and sharper than business cycles.

The results do not support the argument that financial conditions do not predict, but only reflect business cycles for commodity-exporting economies. The contemporaneous correlation between FCIs and output gap is relatively low (less than -0.5). As shown in the appendix, the Granger causality test reject that the FCIs with 1 quarter lag does not Granger cause the output gap by at the 5 percent significance level, suggesting that financial condition is useful for predicting near-term economic activity. The result suggests that the loosening/tightening of financial condition could lead to the booming /recession in the economy.

Figure 4. FCIs and Business Cycle



The finding that the financial condition is a useful indicator of future business cycle for a commodity exporting country is in line with the empirical evidence from a Large Bayesian VAR shown by Doojav and Luvsannyam (2019). They show that external shocks are important sources of macroeconomic volatility in Mongolia and China's growth and FDI shocks are primarily transmitted through the real sector and bank lending channels. González et al. (2015) show that the income from the resource sector (i.e., the surge in commodity prices) increases total credit expands in Colombia, a commodity exporter economy, sensitive to international commodity price fluctuations. Moreover, Brandao Marques and Ruiz (2017) finds that the estimated FCIs for six Latin American economies (Argentina, Brazil, Chile, Colombia, Mexico and Peru) are influenced by a commodity cycle, a global financial cycle and country-specific episodes of financial distress. They also emphasize that the commodity price factor appears

closely correlated with financial conditions in the six countries, with highest correlation with Chile and Argentina.

Table 2. Changes in FCIs and Economic Situations in Different Periods

	2002Q2-2004Q4	2005Q1-2006Q2	2006Q3-2008Q2	2008Q3-2010Q2
IRFCI	-0.7	+1.43	-6.2	+6.42
	STIR -0.89	STIR -0.04	STIR -2.82	STIR 2.05
	REER -0.84	REER 0.93	REER 0.37	REER -0.09
	Rloan -1.04	Rloan 1.38	Rloan -2.69	Rloan 3.08
	RSTI 2.12	RSTI -0.85	RSTI -1.05	RSTI 1.38
ISFCI	-2.1	+1.54	-5.7	+5.22
	STIR -1.46	STIR -0.07	STIR -4.66	STIR 3.39
	REER -1.34	REER 1.49	REER 0.60	REER -0.14
	Rloan -0.43	Rloan 0.57	Rloan -1.10	Rloan 1.26
	RSTI 1.09	RSTI -0.44	RSTI -0.54	RSTI 0.71
	High loan growth Economic recovery	ER appreciation Increase in loan rate	Policy: to reduce loan rate Expansionary fiscal policy	Credit crunch Tight MP
	2010Q3-2011Q4	2012Q1-2013Q1	2013Q2-2014Q2	2014Q3-2014Q4
IRFCI	-3.5	+3.43	-4.1	+1.57
	STIR 0.57	STIR 0.14	STIR -1.00	STIR 0.72
	REER -1.03	REER 0.90	REER -1.26	REER 1.24
	Rloan -1.86	Rloan 1.21	Rloan -1.50	Rloan -0.25
	RSTI -1.16	RSTI 1.18	RSTI -0.35	RSTI -0.14
ISFCI	-2.1	+2.77	-4.5	+2.99
	STIR 0.94	STIR 0.24	STIR -1.66	STIR 1.19
	REER -1.64	REER 1.43	REER -2.01	REER 1.98
	Rloan -0.76	Rloan 0.49	Rloan -0.61	Rloan -0.10
	RSTI -0.60	RSTI 0.61	RSTI -0.18	RSTI -0.07
	Policy: to reduce loan rate Tight MP: RR(2) & PR(3)	Tight MP: RR(1) and PR(2)	Loan growth: from Gov't Expansionary MP: PR(3)	ER appreciation Inflation expectation

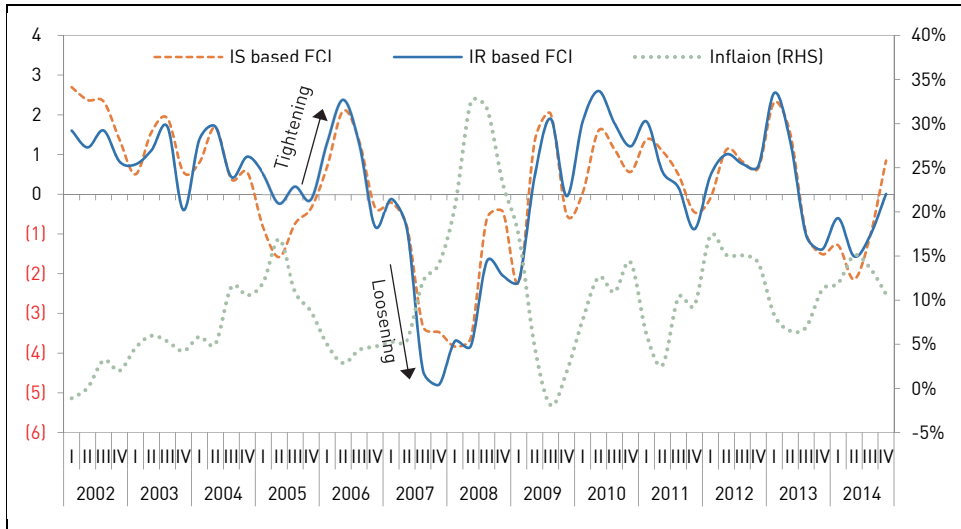
Table 2 summarizes the FCIs (where IS FCI is FCI based on the IS curve and IR FCI is FCI based on impulse response functions) in sub-periods and their decompositions in order to assess what factors explains the financial cycles over the period. The sub-periods are set based on the contraction and expansion phase of the FCIs. For the sub-periods, 2002Q2-2004Q4, 2006Q3-2008Q2, 2010Q3-2011Q4, 2013Q2-2014Q2, the FCIs were in the expansion phase, while they were in the contraction phase for the period 2005Q1-2006Q2, 2008Q3-2010Q2, 2012Q1-2013Q1, 2014Q3-2014Q4. Between the 2006.Q3 and 2008.Q2 (before the GFC), overall financial conditions were significantly accommodated because of the expansionary fiscal and monetary policies, the exchange rate depreciation, the increase in credit growth and the rise in stock prices. It is in line with the evidence that financial condition is highly dependent of the financial, monetary and real-economy policy regimes in place.

The average GDP growth rate reached to 10.6 percent for the period 2006.Q3-2008.Q2, which is 4 percentage points higher than the average growth for period 2002.Q2-2006.Q2. During the GFC, the financial conditions were in the expansion phase because of loose monetary and fiscal policies. Starting from 2008Q3 (after the GFC), the FCIs tightened due to not only monetary policy measures, but also slow growth of bank credit and the falling of stock prices. The tightening of financial conditions leads to the economic downturn. The average GDP growth dropped to 3.6 percent for the period 2008.Q2- 2010.Q2.

Another accommodative financial condition was occurred during the period 2013.Q2- 2014.Q2, which is the period when the Government of Mongolia introduced the price stabilization program to support particular sectors and stimulate the economic growth. During the program period, credit growth reached to 54.9 percent by 2013.Q4 and the GDP growth was above 10 percent.

In order to see how the FCIs are linked with inflation, we plot their dynamics in Figure 5. FCIs seem to have powerful predictive information for the near-term inflation (up to seven quarters). Moreover, the FCIs signal inflation turning points (especially in 2005, 2008, and 2012). Identifying inflation turning points has been known as very helpful for the medium-term inflation forecasting, but very difficult task to accurately estimate. It is clear that inflation starts to fall as financial conditions tightened (i.e., the rise of the FCIs).

Figure 5. FCIs and Inflation Dynamics



The performance of the FCI for Mongolia is not strong as in other developed countries. It can be explained by a number of limitations. First, the number of variables used in the weighted-sum approach is few, and increases in the number of variables are limited given the relatively small sample size. Second, the standard financial variables (i.e., asset price, real exchange rate) used in constructing FCIs contain limited information about market participants' expectations as the financial market is underdeveloped. Third, fluctuations in both financial and macroeconomic variables are driven by same external shocks (commodity demand, commodity price, FDI and Chinese output shocks), leading to high contemporaneous correlation. Doojav and Luvsannyam (2019) find that the external shocks account for almost 50 percent of key macro variables' fluctuations in Mongolia. The relatively weak performance of FCIs is also observed in other emerging economies (see, Zheng and Yu, 2014 for China and Khundrakpam et al., 2017 for India).

## V. CONCLUSION

This paper examines the interactions between financial conditions and business cycles in one of the most commodity-abundant countries-Mongolia. To quantify



financial conditions, we construct two FCIs based on the reduced form IS model and the vector autoregression (VAR) model.

Several empirical results stand out. First, real short-term interest rate and real effective exchange rate gap get a higher weight than real bank loan gap and real stock price gap in the FCIs. Second, financial condition is dependent of the financial and monetary policies in place. Decomposition of the FCIs suggests that the central bank policies (i.e., monetary, exchange rate and macroprudential policies) affect the financial condition in the economy through interest rate channel, exchange rate channel, credit channel and asset price channel. Third, both business and financial cycles are often more pronounced in Mongolia. However, there is no evidence that financial cycles tend to be longer, deeper, and sharper than business cycles. Fourth, financial conditions can help to predict business cycles even in commodity-exporting economies. The FCIs with 1 quarter lag affect the output gap, and they are also helpful in signaling inflation turning points. Overall, the FCIs can be used as leading indicators since they have been found to have predictive information for business cycles (i.e., output gap and inflation).

Though these results have yielded significant insights about the interactions between FCI and business cycles in Mongolia, future studies can be extended to (i) use new measures of FCIs derived from other methodologies such as principal component approach for robustness analysis, (ii) develop an empirical model (i.e., structural Bayesian VAR) including both variables for financial conditions and business cycles to assess how financial conditions are important in business cycles, and (iii) to assess the role of monetary and macroprudential policies in financial conditions as well as business cycles.

## APPENDIX

*Unit Root Test*

Null Hypothesis: Variable Has a Unit Root

Variables	Test equation		Probability H(0) is true	Integration
	None	Intercept		
$y_t$	+		0.00***	I(0)
$rstir_t$	+		0.00***	I(0)
$reer\_gap_t$		+	0.00***	I(0)
$rloan\_gap_t$		+	0.01**	I(0)
$\Delta rspi\_gap_t$	+		0.00***	I(0)
$\Delta lncopp_t$	+		0.00***	I(0)
$\Delta chg_t$	+		0.00***	I(0)

Notes: \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.10$ .*Lag Length Criteria*

VAR Lag Order Selection Criteria

Endogenous variables: GAP\_Y STIR GAP\_REER GAP\_RLOAN GAP\_RSPI

Exogenous variables: C

Sample: 2001Q1 2014Q4

Included observations: 51

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-898.9	NA	1.71E+09	35.4	35.6	35.5
1	-841.6	101.0	4.85e+08*	34.1*	35.3*	34.6*
2	-825.5	25.2	7.08E+08	34.5	36.6	35.3
3	-803.1	30.8	8.43E+08	34.6	37.6	35.8
4	-770.0	38.8*	7.15E+08	34.3	38.3	35.8

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

*Cointegration Test*

Sample (adjusted): 2001Q4 2014Q4

Included observations: 53 after adjustments

Trend assumption: Linear deterministic trend

Series: GAP\_Y STIR GAP\_REER GAP\_RLOAN GAP\_RSPI

Lags interval (in first differences): 1 to 1

*Unrestricted Cointegration Rank Test (Trace)*

Hypothesized	Trace	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.529491	110.1442	69.81889	0.0000
At most 1 *	0.425256	70.18544	47.85613	0.0001
At most 2 *	0.28682	40.83241	29.79707	0.0018
At most 3 *	0.255264	22.91729	15.49471	0.0032
At most 4 *	0.12862	7.29687	3.841466	0.0069

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

*Granger Causality Tests*

Pairwise Granger Causality Tests

Sample: 2002Q1 2014Q4

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
GAP_Y does not Granger Cause IS_FCI	51	1.71232	0.1969
IS_FCI does not Granger Cause GAP_Y		5.36285	0.0249
GAP_Y does not Granger Cause VAR_FCI	51	4.80194	0.0333
VAR_FCI does not Granger Cause GAP_Y		5.07247	0.0289

## REFERENCES

- Borio, C. 2014. "The Financial Cycle and Macroeconomics: What Have We Learnt?," *Journal of Banking & Finance*, vol. 45, no. 1, pp. 182-198.
- Brandao-Marques, L. and E. P. Ruiz. 2017. How Financial Conditions Matter Differently Across Latin America. IMF Working Paper, no. WP/17/218.
- Claessens, S., Kose, M. A. and M. E. Terrones. 2012. "How Do Business and Financial Cycles Interact?," *Journal of International Economics*, vol. 87, no. 1, pp. 178-190.
- Doojav, G.-O. and D. Luvsannyam. 2019. "External Shocks and Business Cycle Fluctuations in Mongolia: Evidence from a Large Bayesian VAR," *International Economic Journal*, vol. 33, no.1, pp. 42-64.
- Gauthier, C., Graham, C. and Y. Liu. 2004. Financial Conditions Indexes for Canada. Bank of Canada Working Paper, no. 2004-22.
- Gomes, F. A. R. and L. S. Paz. 2005. "Can Real Exchange Rate Devaluation Improve the Trade Balance? The 1990–1998 Brazilian Case," *Applied Economics Letters*, vol. 12, no. 9, pp. 525-528.
- Gómez, E., Murcia, A. and N. Zamudio. 2011. "Financial Condition Index: Early and Leading Indicator for Columbia?," *Essays on Economic Policy-ESPE*, vol. 29, no. 66, pp. 176-220.
- González, A., Hamann, F. and D. Rodríguez. 2015. Macprudential Policies in a Commodity Exporting Economy. BIS Working Papers, no. 506.
- Goodhart, C. and B. Hofmann. 2001. Asset Prices, Financial Conditions, and the Transmission of Monetary Policy. Paper Presented in the Conference on "Asset Prices, Exchange Rates, and Monetary Policy," Stanford University, March 2-3, 2001.
- Gumata, N., Klein, N. and E. Ndou. 2012. A Financial Conditions Indexes for South Africa. IMF Working Paper, no. 12/196.
- Hatzius, J., Hooper, P., Mishkin, F. S. M., Schoenholtz, K. L. and M. Watson. 2010. Financial Conditions Indexes: A Fresh Look After the Financial Crisis. NBER Working Paper, no. 16150.
- Ho, G. and Y. Lu. 2013. A Financial Conditions Index for Poland. IMF Working Paper, no. 13/252.
- Johansen, S. and K. Juselius. 1990. "Maximum Likelihood Estimation and Inference on Cointegration - With Applications to the Demand for Money," *Oxford Bulletin of Economics and Statistics*, vol. 52, no. 2, pp. 169-210.
- Khundrakpam, J., Kavediya, R. and J. M. Anthony. 2017. "Estimating Financial Conditions Index for India," *Journal of Emerging Market Finance*, vol. 16, no. 1, pp. 61-89.
- Lack, C. 2003. A Financial Conditions Index for Switzerland. BIS Papers, no. 19. pp. 398-414.
- Li, B. G., Gupta, P. and J. Yu. 2017. "From Natural Resource Boom to Sustainable Economic Growth: Lessons for Mongolia," *International Economics*, vol. 151, pp. 7-25.
- Maino, R., Imam, P. A. and Y. Ojima. 2013. Macprudential Policies for a Resource Rich Economy: The Case of Mongolia. IMF Working Paper, no. 13/18.
- Matheson, T. 2011. Financial Conditions Indexes for the United States and Euro Area. IMF Working Paper, no. 11/93.
- Mayes, D. G. and M. Virén. 2001. Financial Conditions Indexes. Bank of Finland Discussion Paper, no. 2001-17.

- Osorio, C., Pongsaparan, R. and D. F. Unsal. 2011. A Quantitative Assessment of Financial Conditions in Asia. IMF Working Paper, no. 11/170.
- Zheng, G. and W. Yu. 2014. "Financial Conditions Index's Construction and its Application on Financial Monitoring and Economic Forecasting," *Procedia Computer Science*, vol. 31, pp. 32-39.
- 

First version received on 1 March 2019

Peer-reviewed version received on 15 April 2019

Final version accepted on 2 May 2019



© 2019 EAER articles are distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author (s) and the source, provide a link to the Creative Commons license.