



Liquidity Excess and Futures Copper Price

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Abstract: The main contribution of this paper is to identify the relationship between liquidity excess and futures copper price in developing countries. To this end, we compare various measures of liquidity excess and identify one that can measure the degree of liquidity excess and which is particularly applicable to developing countries like China. Through multiple regression analysis, it is found that liquidity excess accounts for the changes of copper prices in the future market.

Keywords: Liquidity, Excess, Futures, Copper, Prices

1. Introduction

In the paper we examine the link between currency liquidity excess and volatility of futures copper prices. Currency liquidity is not only an economic issue, but also a monetary phenomenon. Over the past 10 years there is a significant fluctuation of liquidity in the macro monetary economic operation among the major world economies. From 2001 to 2007 there was a significant excess, but towards the end of 2007 when subprime mortgage crisis broke out, the real economy gradually fell into decline and came to a standstill, which contributed to the extreme shortage of liquidity by the end of 2008. When the world economy recession intensified due to the financial crisis, all the countries adopted a loose monetary policy and active fiscal policy to stimulate the economy, the first half of 2009 witnessing the sudden global liquidity change from shortage to excess, which is particularly prominent in China and other emerging economies. Hence, understanding the effects of currency liquidity on market dynamics has gained an increased attention from regulators, market participants and academics alike.

Many studies have tried to find the relationship between the provision of money and all kinds of financial asset price volatility. For instance, Roger Ferguson (2007) focused on the analysis of the impact of changes in the broad monetary aggregates on the stock and real estate price index. However, the results have shown great difference and instability in different asset types. This finding is consistent with the views

of many other scholars such as Bruggeman (2007), Sebastian (2007) and White (2006).

Besides, most of the studies are based on developed countries up to now. Actually, currency abnormality and volatility of prices are more prominent in emerging economies, which contributes too many economic problems such as inflation, rises in prices in both spot market and future market and so on, so it is more urgent to find out the predictive power of currency provision on macroeconomic operation in developing countries.

There are many factors involved in the measurement of the liquidity excess, but they can be divided into quantitative index and price index. By means of a brief carding and analysis, we show that M2/GDP is the most suitable measure of liquidity excess for emerging economies like China. In fact, the measure we revised can not only reflect the rough situation of liquidity, but also indicate the degree of liquidity excess. We use the data set of both China and the US from 1999 to 2008 to validate the measure.

We apply the measure of liquidity excess to evaluate the predictive power on prices in Shanghai Futures Exchange and Hongye Futures Brokerage Company, with copper as a case. In order to measure the volatility precisely, we made a log processing of the explanatory variables and all of the control variables in advance to improve the model. It is found that the combination of the money supply growth rate, inventories and GDP growth rate, the exchange rate of RMB against the U.S. dollar and Shanghai stock composite index can explain 80.7%

of the fluctuations of copper prices.

Finally, we find that liquidity excess is caused by the loose monetary policy adopted by three world largest economies and that the liquidity excess leads all the asset prices to rise, including copper prices in the future market.

This paper relates to the literature that attempts to measure the liquidity excess considering quantitative index and price index. In the case of quantitative index, researchers attempted to calculate the liquidity excess from the perspectives of money gap, money overhang, or M/GDP. For instance, Polleit & Gerdesmeier (2005), calculated the liquidity excess by means of money gap in the euro area. Gouteron & Szpiro (2005), Rueffer & Stracca (2006), Belke et al. (2009) used M/GDP index to point out that there existed excess liquidity in the euro zone, the United States, Japan and the United Kingdom. Borio & Lowe (2002) and Gouteron & Szpiro (2005) used the Credit/GDP index besides M/GDP and interest rates to measure the excess liquidity. Similar studies were carried out in China too. For instance, Xu and Ye (2008) applied the monetary excess index in China to calculate the surplus situation from the first quarter of 1997 to the second quarter of 2007. Li (2006) also calculated China's a surplus of money from 1978 to 2004 by estimating money demand function. Ha (2007), Xia and Chen (2007) and Zhang (2009) used M / GDP index to study China's excess liquidity. However, most of them just adopt the existing measure models to make the calculation of the liquidity excess without any revision.

This paper is part of the market microstructure literature that examines the predictive power of liquidity on volatility. Baks & Kramer (1999) and Giese & Tuxen (2007) studied the impact of currency liquidity surplus on stock market returns in various countries. Some scholars also tested the impact of Chinese liquidity abnormality on asset prices with empirical studies, concluding that changes in market liquidity is the main reason for the current asset price fluctuations (Liu and Zhang, 2007). Based on the VEC, Jin et al. (2010), Tian & Fang (2010) and Xu et al. (2010) found that continuous rise in asset prices and liquidity excess are an important feature of China's economic operation in recent years, and that liquidity excess and investor behavior are the two important factors of asset price fluctuations by introducing liquidity excess into noise trading model. However, few of these studies made a comprehensive analysis through multivariate regression.

Our main contribution to the literature is threefold. First, we identify a particular measure of liquidity excess which is especially applicable to developing countries. In measuring excess liquidity, we use "money gap" index to calculate the monthly Marshall K value in the sample period (such as $m2 / GDP$) and the deviation value of the long-term trend after the HP filter, and then to subtract the statistical average deviation values of all the samples. Thus, the liquidity excess calculated in this way is more concise and stable. Second, we improve the model of calculating volatility by making a log processing of the explanatory variables and all of the control variables in advance. So, $AVOL_t$ is on a logarithmic scale in calculation. Third, unlike the former studies, which examine the volatility-liquidity

relationship at an individual stock level, we provide further theoretical research and more empirical evidence to prove that the excess liquidity has effects on volatility of prices by means of a comprehensive empirical study.

The rest of the paper is organized as follows. In the next section, we provide a brief explanation of the choice of the indexes of the measurement. In Section 3, we introduce a suitable measurement of the liquidity excess for developing countries like China. In Section 4, we apply the measurement to evaluate the predictive power on copper prices. The last section is the conclusion.

2. Choice of Indexes

Capital liquidity excess is a kind of macro excess liquidity, which is more than the balance of the stock of money supply. The current measurement methods can be divided into quantitative measure and price measure.

In the case of quantitative measure, several indexes are involved like money gap, money overhang, credit and so on. However, M/GDP index is more common in the empirical literature, though there are relatively few theoretical discussions. M here refers to the money supply, the broad money supply. M/GDP index can be used to measure the excess liquidity because it provides information about the total amount of money relative to the economy. Specifically, the index is subdivided into three kinds, that is, the horizontal value, the dynamic growth rate of the logarithm, and the deviation from the trend value.

The price index to measure the excess liquidity is based on interest rate. As the price and quantity of money supply are related to each other, the understanding of excess liquidity can be interpreted from both the quantity of money and the price. The amount of excess liquidity is generally measured in equilibrium or GDP, while its price scale is generally measured in the natural interest rate or the Taylor rule interest rate.

From the previous empirical study, it is found that the M/GDP index is the most widely used of various kinds of measures of money liquidity. There are several reasons for this. As with the index of money excess, there is no choice of base in M/GDP index. Because M is the total amount of money supply, the index also includes the cumulative effect of monetary expansion. In addition, as the M/GDP index is the actual value, it can be directly applied in calculating the liquidity excess.

M/GDP is particularly suitable for developing countries. In the case of China, the economic significance of the rising ratio of $M2/GDP$ lies in the fact that the income elasticity of China's public money demand is greater than 1. With the reform and opening up of the market, degree of monetization in trading continues to deepen in China. For example, some of the commodities in the planned economy belong to the governmental free supplies or low-cost supply, but after the reform they should be transacted according to the market price, from needing no money or a small amount of money to needing more money, and those that did not enter the transactions in the

past enter the trading areas now. Therefore, the public demand for monetary transactions continues to rise. The degree of monetization in economic life has been increasing, resulting in rising demand for money, reflected in the M2/GDP index. In other words, economic monetization increased the public's demand for money and their transaction motivation, resulting in a long-term rise in the level of M2/GDP.

In developing countries like China, their economic activities can be divided into two parts: the monetary part and the non - monetary part. Generally speaking, the monetary part of the transaction is achieved in the market, while the non - monetary part, to a certain extent, is connected with the self-sufficiency economy of the barter exchange. With the economic reform, the monetary part of the transaction in China is growing, which is reflected in the following aspects: firstly, by increasing the income of residents and corporate profits, the transaction demand of residents and businesses has increased; Secondly, through the rural contract responsibility system, farmers enter the market, with the original self-sufficiency of agricultural products trading gradually transformed into the agricultural product market, increasing the share of currency transactions; Thirdly, by developing other economic composition beyond the public ownership, the supply of production materials and consumer products market has been expanded. When citizens' income grows ceaselessly, market capacity continues to expand, and currency's trading continues to increase; Fourthly, the production factors market is gradually opening up. With the continuous deepening of the reform, the securities market, the real estate market and the labor market have been gradually opening up. The introduction of these markets can be regarded as the generalized monetization, because money in the original meaning of the monetization is used as a medium of exchange, while in the capital market, especially in the stock market and real estate market, money plays a role in the circulation as a means of wealth. The first three factors have been more stable,

but the fourth is currently in full swing in China, with a more rapid growth of the general circulation of money compared to the rapid growth of GDP. Obviously, Marshall K can reveal the liquidity abnormality in China more clearly.

Based on the above analysis, in the study of the impact of liquidity excess on the future market, it is more appropriate for this article to choose Marshall K value, M2/GDP, as a measure of liquidity excess.

3. Measurement of Liquidity Excess

The indexes in the preceding discussion can only roughly reflect the liquidity situation, but how can we measure the degree of liquidity excess? We compute the Marshall K value (M2 / GDP) as a measure of liquidity. Of course, we can also compute M2 growth rate of the nominal GDP growth rate as the measurement of liquidity. In fact, economic meaning is basically the same. The Marshall K value has the superiority of being always positive in econometric modeling, so this article chooses Marshall K value as the foundation of measurement. In order to increase the frequency of samples, we compute monthly Marshall K value in the sample period, that is, we use m2 / nominal GDP in order to capture the mobility of higher frequency changes. We select monthly frequency as sample index, in which approximate data of monthly GDP is obtained by the interpolation of the quarterly GDP data. (The interpolation may have the weakness of losing real volatility.)

In measuring liquidity excess, we use the index of money gap as a measure of the degree of liquidity excess, that is, excess liquidity, abbreviated (EL), is obtained by calculating the monthly Marshall K value in the sample period (such as m2 / GDP) and the deviation value of the long-term trend after the HP filter, and then subtracting the statistical average deviation values (or median) of all the samples. The calculation formula is as follows:

$$EL = \text{Min} \left\{ \sum_{t=1}^T (K_t - Ktrend_t)^2 + \theta \sum_{t=2}^{T-1} ((K_{t+1} - Ktrend_t) - (K_t - Ktrend_{t-1}))^2 \right\} \tag{1}$$

In the formula, $\theta = 14400$

$$EL_t = K_t - Ktrend_t$$

4. Multiple Regression Analysis

We use EL_t as the benchmark index measuring liquidity to analyze the impact of liquidity on the price of copper.

$$AVOL_t = \beta_0 + \beta_1 EL_t + \beta_2 totalstock_t + \beta_3 ip_t + \beta_4 dollar_t + \beta_5 isp_t + \varepsilon_t \tag{2}$$

The estimated results are as follows (the letter d before the name of the variable means being processed by the first order difference):

$$dAVOL_t = -0.735 + 1.109d \ln EL_t - 0.051 \ln totalstock_t + 0.294 \ln ip_t - 2.017d \ln dollar_t - 0.538d \ln isp_t \tag{3}$$

$$\begin{pmatrix} 0.2695 \\ 3.0926 \end{pmatrix} \begin{pmatrix} 0.0741 \\ -2.0472 \end{pmatrix} \begin{pmatrix} 0.5015 \\ 0.6867 \end{pmatrix} \begin{pmatrix} 1.2637 \\ -2.9462 \end{pmatrix} \begin{pmatrix} 1.2473 \\ -3.1542 \end{pmatrix}$$

$$R^2 = 0.804 \quad Adjusted - R^2 = 0.792 \quad D.W = 1.409 \quad F = 6.7$$

Model fitting $R^2 = 0.807$ (adjusted $R^2 = 0.792$), indicating that the combination of the money supply growth rate, copper inventories and GDP growth rate, the exchange rate of RMB against the U.S. dollar and Shanghai stock composite index can explain 80.7% of the fluctuations of copper prices. The concomitant probability of F test was 0.000283, which showed that the regression equation was significant at 1%. $D.W = 1.409$, for $n=38$, $k=5$, critical value at 1% is $d_u = 1.58, d_l = 1.03$, suggesting that the residual sequence does not have the autocorrelation in the sequence.

Model fitting is not very high, suggesting that there are some variables which are difficult to control, and the uncontrolled variables affect the fluctuations of copper price. However, we here use a first-order difference method, so it can be said that those omitted variables which do not change with the time do not cause the endogeneity in the model after the first order difference.

5. Conclusion

To measure the degree of the liquidity excess, we propose a measure which is based on M2/GDP and which is especially applicable to developing countries. We also improve the existing calculation of volatility by making a log processing of the explanatory variables and all of the control variables in advance. Through multiple regression analysis, it is found that liquidity excess accounts for the changes of copper prices in the future market. We conclude that the economic impact of the liquidity excess is significantly larger in developing countries like China where currency abnormality is more prominent.

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