**The Convergence of Inflation Expectation through Security Trading:**

**Evidence from Maturing TIPS**

Quentin C. Chua,\* and Pawan Jaina

a Department of Finance, Insurance and Real Estate, Fogelman College of Business and Economics, The University of Memphis, Memphis, TN 38152

\*Corresponding Author. Voice: 901-678-4643 Fax: 901-678-1714, Email: qchu@memphis.edu

**The Convergence of Inflation Expectation through Security Trading:**

**Evidence from Maturing TIPS**

**1. Introduction**

 A major function of security trading is to incorporate diverse information about security’s future cash flows. The trading of maturing U.S. Treasury Inflation-Protected Securities (TIPS) during the last two-month prior to the final Consumer Price Index (CPI) announcement date provides a unique window to document the convergence of inflation expectation implied in TIPS prices to the actual announced CPI. The cash flows associated with TIPS are directly tied to the announced inflation. During the last coupon period, maturing TIPS are gradually transformed into a default free pure discount bond like Treasury bills. Once the inflation protection function is gone, the sequence of maturing TIPS prices reveals the market searching process for the yet announcement of final CPI level. A time series of implied target CPI derived from daily TIPS and Treasury nominal security trading prices are compiled as an estimate of inflation expectation. The study investigates the timing and speed of the convergence of inflation expectation toward the announced CPI.

**2. Literature Review**

 In 1997 TIPS began to be sold and traded in the US market on an unrestricted basis. TIPS provide two guarantees: (1) that investors will receive an inflation-adjusted amount or the security’s real par value at maturity, whichever is greater; and (2) that coupon and principal payments will be adjusted for the inflation occurring between issue and payment dates. These unique U.S. Treasury instruments that protect against future inflation are now viewed as belonging in most well-diversified investment portfolios (Roll, 2004).

The consumer price index for all urban consumers (CPI-U) was chosen to measure price level changes. The Bureau of Labor Statistics (BLS) surveys prices each month, and around the middle of the subsequent month announces changes in retail prices experienced by American consumers during the previous month. The reference CPI used to accrue interest on any date is based on a lag of three months.

The market’s ability to aggregate information about inflation prior to public announcement has been a focus of extensive research. Kandel, Ofer and Sarig (1993) study Israel inflation expectations over terminal 10-day windows of 39 issues of Israeli indexed bonds. They find that major adjustment of the inflation expectation toward the actual level of inflation occurs in the first two days. Assuming that the U.S. TIPS market is as efficient as the Israeli indexed bond market in aggregating inflation information, currently available nine issues of maturing TIPS prices are used to investigate how TIPS trading helps market shape up its inflation expectation before the official CPI announcement by the BLS. A recent study by the author of the proposal published in the *Financial Analysts Journal* (FAJ) investigates when TIPS prices adjust to inflation information. The FAJ study finds that TIPS prices adjust to inflation information without delay during the CPI survey period and even before the beginning of the survey period. While the FAJ study investigates the reaction of TIPS daily holding period return to inflation information, the proposed study focuses on time series property of the second moment of inflation prediction errors.

**3. The Implied Target CPI**

The implied target CPI based on the invoice price of TIPS on the observation date *t* can be computed as:

  (1)

where *T* denotes the maturity date of a specific issue of TIPS, *IB* is the reference CPI for the original dated issue date, *Pt* is the TIPS invoice price, *b(t, T)* is the price of default free pure discount bond with a face value of one dollar, and c is the real coupon rate of TIPS. All variables on the right-hand side of equation (1) are given or observable in the Treasury security markets. The implied target CPI represents a sequence of market’s inflation expectation. The convergence of inflation expectation is measured by the sequence of deviation between the actual CPI, $I\left(T\right), $and the implied target CPI, $I\_{T}^{\*}\left(t\right),$ as defined below:

$δ\_{t,j}=I\left(T\right)-I\_{T}^{\*}$(t) $t=-44, -43,…, -1 , 0 and j=1, 2, .., 9.$ (2)

The window of observation for maturing TIPS covers 45 business days and ends on the target CPI announcement date, i.e., day zero. All available nine issues of matured TIPS are included in the study.

**4. Hypotheses To Be Tested**

If the trading of TIPS help market aggregate inflation information, we expect that the variance of the deviation terms decrease as TIPS prices incorporate inflation information through trading. Specifically, we are testing the hypothesis

 $Var\left(δ\_{t}\right)\geq Var\left(δ\_{t+1}\right)$, $t=-44, -43, …, -1, 0.$ (3)

Furthermore, the 45 business day window covers three monthly CPI announcement dates including the announcement of target CPI. The study also investigates whether the CPI announcements imposes significant impact on reducing the deviation between the actual CPI and the implied target CPI.

**5. Data and Methodology**

 Nine issues of maturing TIPS are included in the current study. In the near future, two additional TIPS issues will mature in April and July 2012. TIPS and Treasury nominal security prices are retrieved from the Datastream database. Inflation announcement dates and reference CPI are downloaded from the TreasuryDirect website ([www.TreasuryDirect.gov](file:///D%3A%5CPost%5CSpring%202012%5C2012%20Summer%20Research%20Grant%5Cwww.TreasuryDirect.gov)).

 The deviation terms represent a sequence of updated forecast errors. The dynamic change of the $δ\_{t,j}$’s are modeled as an autoregressive process. Assuming multivariate normal distribution for the deviation terms, maximum likelihood method is used to estimate variance terms, $Var(δ\_{t}$), and the autoregressive parameters.

**6. Preliminary Results**

Figure 1 shows the time series of the deviations between actual and implied target CPI for the nine issues of maturing TIPS. There is a decreasing trend in the absolute values of the deviations. Through the trading of TIPS, the market’s inflation expectation implied in maturing TIPS prices move closer and closer toward the actual CPI level. The convergence of inflation expectation in terms of the time series of variance terms is shown in Figure 2. An econometric model incorporating autoregressive property of deviation terms and the subsequent maximum likelihood estimation procedure will be applied to estimate the variance terms and test the hypotheses proposed in this study.

 Survey method has been the common approach to gauge the inflation expectation in the market. This study derives inflation expectation based on TIPS trading prices. Participants in TIPS market have a stake in their trading activities. TIPS prices provide a quality data source to document the convergence of inflation expectation. Finally, the number of matured TIPS will increase by two to three issues per year for the next few years. A larger data set enhances the reliability of parameter estimates and the significance of hypothesis tests.

**References**

Roll, R., 2004, Empirical TIPS. *Financial Analysts Journal* 60 (January/February):31-53.

Kandel, S., A. R. Ofer, and O. Sarig, 1993 Learning from trading. *Review of Financial Studies*, vol.6(3):507-526.