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Identifying proxies for risk-free assets: Evidence from the zero-beta Capital Asset Pricing Model

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Abstract

This research offers the first analysis of whether gold, treasury bills, Overnight Index Swaps (OIS), or Interbank Offered Rates (IBOR) can be used as proxies for risk-free assets in the UK, the US, China, Japan, and India. Using Black's (1972) zero-beta capital asset pricing model, we apply the Wald and likelihood ratio tests to examine whether gold, T-bills, OIS, or IBOR qualify as zero-beta or risk-free assets against companies in the FTSE 350, S&P 500, SSE 180, NIKKEI 225, and SENSEX. We find that gold is a proxy for the risk-free asset in the UK and China; T-bills are a proxy in Japan; and IBOR are a proxy in China. None qualifies for the US market. According to our results, there is no universal risk-free asset for the UK, the US, China, Japan, and India.

Keywords: Risk-free asset; Zero-beta asset; Zero-beta CAPM; Gold; T-bills; OIS.

1. Introduction

Even though the capital asset pricing model (CAPM) has been widely used in academic literature and real-world investment advice, criticism has arisen concerning its practical application (Fama and French, 2004). The problems with the CAPM include the following. First, using historical evidence to predict the future return of assets is insufficient. Second, the beta coefficient does not allow for time variation. Finally, there are no transaction or opportunity costs. However, the CAPM is still one of the most important and widely used models, with beta, its main output, being computed and published by various financial websites.

One of the foundations of the CAPM, along with other core models in finance, such as the Black-Scholes option pricing model, is assuming the existence of a risk-free asset in the market. However, in practice, a risk-free asset is difficult to find because the model assumes that the variance of its return must be zero. This study will provide the first empirical assessment of whether a variety of assets qualify as risk free.

The CAPM assumes that the rate of return on risk-free assets will remain constant (zero variance) over discounting periods and is uncorrelated to the market. However, the three-month government treasury bill (T-bill) monthly rate of return is not constant over time but fluctuates (Fig. 1). Even with this evidence, scholars and investors still use the option of T-bills as a proxy for a risk-free asset.

[Insert Figure 1 here]

Government T-bills have been considered a proxy for risk-free assets for years. This is mainly because they are backed by the government with guaranteed returns. When taught in “Intro to Finance” classes, a risk-free asset is often referred to as being default risk free for this reason, while it is assumed to be affected by other risks, such as inflation.

However, the default risk-free feature of T-bills does not mean that they are a good proxy for a risk-free asset, instead they are a practical rule of thumb when applying the CAPM in practice. Furthermore, Nippani and Smith (2001) and Nippani et al. (2010) have shown that there is a potential default risk in T-bills, making the rule of thumb invalid.

To avoid these problems, we use the zero-beta CAPM (Black, 1972) as the assumptions of this model are more appropriate for this study. This model is neither as widely used nor as popular as the classic CAPM. The zero-beta CAPM assumes that a risk-free asset is either

missing or unknown. Additionally, according to the condition of zero variance of returns, it is difficult to discover any asset as risk free .

Therefore, the assets are commonly used as proxies for risk-free assets because they are uncorrelated to the market being used within the zero-beta CAPM. In other words, assets are used as a proxy if they are found to be zero-beta assets, suggesting that they have zero systematic risk. The Zero-beta CAPM is employed here for the first time to test whether the candidate assets can be described as zero-beta assets to then use their proxy for the risk-free asset in the CAPM and other empirical applications.

We employed the Wald test and likelihood ratio test (LRT) to examine whether certain assets can be used as a proxy for risk-free assets. We use a Wald test to investigate the validity of assets as zero-beta on individual stock data.

We use a wide and representative sample of stocks. We include every company in the FTSE 350 in the UK, the S&P 500 in the US, the SSE 180 in China, the NIKKEI in Japan, and the SENSEX in India. These indices represent the equity markets in each country, and we test each potential zero-beta/risk-free candidate asset against each company.

This study is motivated by He et al. (2018). They find that gold's beta is estimated as being statistically insignificantly different from zero and conclude that there is evidence that gold returns are uncorrelated to the equity market in the UK and US. This raises a question as to whether gold can be a proxy for risk-free assets in the UK and US markets.

In addition, we assess traditional proxies for T-bills, Interbank Offered Rates (IBOR), and Overnight Indexed Swaps (OIS). These are the most commonly used proxies for the risk-free rate in finance textbooks (e.g., Henrard, 2014) and empirical studies (e.g., Smith, 2013; Kapan and Minoiu, 2018; Lloyd, 2020). We used Sterling Overnight Index Average (SONIA) for potential assets in the UK, Secured Overnight Financing Rate (SOFR) in the US, and Tokyo Overnight Average Rate (TONA) in Japan. Owing to the lack of data on OIS in China and India, we chose IBOR.

Employing Black's (1972) zero-beta CAPM can provide an empirical method to assess whether gold, T-bills, OIS, or IBOR can be a zero-beta asset to be a proxy for the risk-free asset. If they are not, it would be a direct impact on the classic CAPM in the real-world investment since there would be a problem with the proxy for the risk-free asset. The

expected excess returns on assets and market portfolios would not be the same, which would affect the estimated beta coefficient.

The methods used in this research demonstrate a strict and theoretical way to examine possible zero-beta assets in the zero-beta CAPM, and thus proxies for the risk-free asset. The risk-free rate in the CAPM originated from the assumption of the uncorrelation between the risk-free asset and market. Applying the Wald test and LRT allows the data to determine what is a proxy for the risk-free asset among T-bills, OIS, ILOR, or gold rather than assuming.

Since the classic CAPM is widely known, it will not be described further. Section 2 will review the related research regarding the classic CAPM, risk-free and zero-beta assets, zero-beta CAPM, T-bills, OIS, and IBOR. Section 3 will briefly describe data. Section 4 will detail the methodology of the zero-beta CAPM and the hypothesis tests related to it. Section 5 will present the empirical results. The conclusion will be presented in Section 6.

2. Literature Review

2.1 The CAPM

The CAPM is one of the most important models in finance (Sharpe, 1964; Lintner, 1965a, 1965b). A similarity between the models is that they all rely on the foundations of the Markowitz's (1952) modern portfolio theory. This includes investors as mean-variance optimizers. Markowitz (1952) examines risky assets with the nonlinear efficient set, and Sharpe (1964) and Lintner (1965a, b) add the assumption that there is a risk-free asset allowing investors to divide their portfolio between risky and risk-free assets. This assumption in the CAPM greatly facilitates the pricing of securities and assets and the examination of the relation between assets and stock markets. This contribution has had a large impact on the finance theory; however, there are severe problems in the CAPM.

One crucial criticism stems from the results of Fama and French (1993), which find that beta does not sufficiently explain the expected return. Fama and French (1996) argue that the CAPM is a "dead" model owing to the bad proxies for the market portfolio.

However, the problem might be the sample selection in empirical tests, not the model itself. Yoshino and Santos (2009) collaborate the three-factor model in Fama and French (1993) in the Brazilian stock market to test whether the CAPM is "dead." Their results suggest that the

intercept is not zero in the empirical tests and there are other explanatory variables for the stock premium.

However, research has not emphasized the other weak point in the CAPM. Previous research has focused on beta or the proxies used for market portfolio, but here we focus on the risk-free asset in this study. The risk-free asset is seen everywhere in the literature after its introduction, providing a zero point which can measure everything else. Sharpe (1964) and Lintner (1965a, b) introduce the risk-free rate as the rate of return on an asset whose variance is zero and equivalent to an interest rate. This is the zero-default-risk asset and not the assumed risk-free asset in the CAPM. However, some researchers and investors are using it as the risk-free asset for granted, or some know that T-bills are not risk-free, but it may not have a big issue for practical purposes. No one has ever questioned whether T-bills, IBOR, or OIS can be used as valid risk-free assets in the CAPM.

2.2 Risk-free and zero-beta assets

The risk-free asset in the CAPM and the zero-beta asset in Black (1972) are not identical. The risk-free asset is based on the measurement of zero variance of its returns, whereas the zero-beta asset is based on the uncorrelated relation between the asset and market. Moreover, it is shown in the derivation of the risk-free rate according to Cochrane (2009).

A risk-free rate is the rate of return in an asset or portfolio that has zero risk. The risk-free rate has the following mean-variance presentation:

$$R^f = R^* + R^f R^{e*} \quad (1)$$

where R^* denotes the return of the portfolio on the mean-variance frontier, R^{e*} represents the excess return on the mean-variance frontier.

Each of the following returns (the constant-mimicking portfolio, minimum variance, and zero-beta returns) has one property of the risk-free rate in the market where there is no risk-free rate. That is, each return is mean-variance efficient. Assuming there is one risk-free rate, the returns that have the quality of a zero-beta return R^α , minimum variance returns $R^{min.var.}$, and constant return $\hat{R}$ are expected to reduce to the risk-free rate.

$$\text{Constant-mimicking:} \quad \hat{R} = R^* + \frac{E(R^{*2})}{E(R^*)} R^{e*} \quad (2)$$

$$\text{Minimum variance:} \quad R^{min.var.} = R^* + \frac{E(R^*)}{1-E(R^{e*})} R^{e*} \quad (3)$$

$$\text{Zero-beta:} \quad R^\alpha = R^* + \frac{\text{var}(R^*)}{E(R^*)E(R^{e*})} R^{e*} \quad (4)$$

Assuming that there is one risk-free rate, Equations (2), (3), and (4) are all the same. The following equation must hold:

$$R^f = \frac{E(R^{*2})}{E(R^*)} = \frac{E(R^*)}{1 - E(R^{e*})} = \frac{\text{var}(R^*)}{E(R^*)E(R^{e*})} \quad (5)$$

Deriving from the expectation of Equations (2) and (5), we obtain the following:

$$\frac{E(R^{*2})}{E(R^*)} = E(R^*) + R^f E(R^{e*}) \quad (6)$$

After rearranging Equation (6), the risk-free rate is as follows:

$$R^f = \frac{E(R^{*2}) - E(R^*)^2}{E(R^*)E(R^{e*})} = \frac{\text{var}(R^*)}{E(R^*)E(R^{e*})} \quad (7)$$

Given Equations (4) and (7), the risk-free and zero-beta rates are not the same. As the zero-beta return is the mean-variance efficient return that is uncorrelated to another mean-variance efficient return, it may seem reasonable to consider the zero-beta asset's return as the proxy for the risk-free return. Although the risk-free asset cannot be easily found, testing potential assets as the zero-beta asset in the zero-beta CAPM would be another way to find the proxy for the risk-free asset.

2.3 Black's zero-beta CAPM

The CAPM assumes that an asset is risk free if the variance of its returns is zero. This assumption has been used for years and its existence is commonly accepted as a rule of thumb. Lintner (1969) derives the specification of the market's composite parameters and probability assessment with and without a risk-free asset. He states that the market's assessment of expected prices will be directly altered by the differences in risk assessments when there is no risk-free asset. In other words, the expected prices will be estimated differently through the CAPM if a risk-free asset does not exist.

Black (1972) is the first to replace the risk-free asset in the CAPM for another asset, which is described as a zero-beta asset afterward. This does not specifically question the existence of a risk-free asset, rather his model is more generic assuming that investors may take long or short positions in the risky asset without allowing risk-free asset. Interestingly, Black stated that his assumption is not realistic owing to the restrictions on short selling, not due to the

risk-free asset. This implies that he did not question the existence of the risk-free asset, and he was trying to derive the equilibrium when the risk-free asset would not be accessed.

The idea was to construct an asset pricing model in the absence of the risk-free asset. The zero-beta asset is defined as an asset that has the minimum variance and is uncorrelated to the market. In addition, the residuals in the zero-beta CAPM are approximately mutually independent in Black (1972).

The derivation of the zero-beta CAPM will start from the CAPM with the zero-beta asset instead of the risk-free asset, which is assumed to be missing.

$$E[R_{i,t}] = E[R_{0,t}] + \beta_i[E[R_{m,t}] - E[R_{0,t}]] \quad (8)$$

where $E[R_{i,t}]$ denotes the expectation of the raw return of asset i in a stock market at period t , $E[R_{0,t}]$ indicates the expectation of the return of the zero-beta asset at period t , $E[R_{m,t}]$ represents the expectation of the return of the market portfolio at time t , and β_i the coefficient for asset i .

Thus, equation (8) is:

$$E[R_{i,t}] = (1 - \beta_i)E[R_{0,t}] + \beta_iE[R_{m,t}] \quad (9)$$

Black (1972) shows that the zero-beta asset has a covariance with risky asset proportional to $(1 - \beta_i)$, which lacks the introduction of a proper method for testing. To test whether an asset is a zero-beta asset, we examine the statistical insignificance of the coefficient of $E[R_{0,t}]$, and the covariance between $R_{i,t}$ and $R_{0,t}$ should be determined to examine whether the covariance between the zero-beta and risky asset is proportional to $(1 - \beta_i)$.

Since the zero-beta CAPM was developed, numerous studies have tested the model itself. Faff (1991) follows the multivariate approach developed in Gibbons (1982) to test whether the beta was time varying using Australian equities. However, the variables in their model are not the same as those in this research. We only apply the original zero-beta CAPM without adding additional variables.

We use the Wald test and LRT on the constraints on parameters. These are examined by the weighted distance between the hypothesized value and the estimates under the null hypothesis in the Wald test (Fahrmeir et al., 2013). The LRT assesses two statistical models by the ratio of their likelihoods, specifically one computed by the maximization and the other

with the constraint. Unlike the LRT, the Wald test only requires the estimation of one unrestricted model. The process is based on testing whether a set of estimated parameters is equal to some value in the null hypothesis in the Wald test.

As the development of the econometrics for the CAPM hypothesis in Gibbons (1982), the Wald test and LRT are employed to test the zero-beta asset in the zero-beta CAPM. In addition, there are alternative tests explained in Shanken (1985), which are the cross-sectional regression test, Lagrange multiplier test (LMT), and LRT. Chou (2000) develops an analytical Wald test with the generalized method of moments in the test of the zero-beta CAPM. The Wald test and LRT are the methods often applied in the zero-beta CAPM research. The Wald test is employed in this research because the data of expected returns of the zero-beta asset, which in this research is assumed to be gold and T-bill, can be obtained and estimated.

Chou (2000) applies the Wald test and LRT in the zero-beta CAPM and tests the zero-beta CAPM in the absence of the risk-free asset. Neither Wald test nor LRT is used to assess whether any assets satisfy the assumptions to be considered a zero-beta asset in the zero-beta CAPM, let alone testing T-bills as a zero-beta asset.

The Wald test and LRT are asymptotically equivalent. However, the results of the Wald test and LRT may lead to different conclusions. Therefore, we apply the Wald test to the parameters of the zero-beta CAPM to examine whether T-bills, gold, OIS, or IBOR constitute a zero-beta asset across several economies and use LRT as the robustness test owing to its asymptotic equivalence to the Wald test.

2.4 T-bills as the classic proxy for risk-free asset

According to assumptions associated with the classic CAPM, an asset uncorrelated to the market is a risk-free asset. However, the original assumption is to use the asset that has zero variance in its returns, where an assets' variance is the measure of its risk. Essentially, the return on the risk-free asset must have zero variance.

Government T-bills have commonly been used as risk-free assets for decades because they are backed by the government and the rate of return is approximately similar to the interest rate. That is, the government will never default on the Treasury bills, and investors will always get a certain amount of return from T-bills. However, T-bills are not strictly risk-free. According to Markowitz (1952), the risk is measured by the variance of the return. Viewing

T-bills as risk-free assets cannot be based on the zero-beta coefficient to the market or no default risk. Moreover, evidence has demonstrated that the variance of the return of the T-bills is not zero.

Additionally, researchers have found the potential for default in T-bills. Furthermore, it provides evidence that T-bills may not be risk-free assets. Nippani et al. (2001) analyze the sustained effect of the chain of events in the US on the potential default risk by comparing the yield spreads between 1995 and 1996. Their results provide evidence that a potential default for T-bills would occur. In addition, the impact of the events suggests that three-months T-bills are more likely and substantially influenced than six-months T-bills. Furthermore, Nippani and Smith (2010) use the spread between the 10-years USD London interbank offered rate (LIBOR) and 10-year US T-bills as a measure of default risk. According to the test on some major events that occurred, the statistical significance was tested on the change in the spread. The results suggest the potential of default in T-bills for an even longer term. However, the potential of default risk is not the proper way to assess T-bills as risk-free assets. Although their empirical method is not based on the origin of the risk-free asset, their evidence of the potential default risk in T-bills is a good support to whether T-bills are risk-free assets.

2.5 Other proxies: Gold, OIS, and IBOR

In this study, gold will also be tested as the zero-beta asset in the zero-beta CAPM. Owing to its characteristics, researchers and investors consider gold an asset uncorrelated to the stock markets. This provides support that gold can be a zero-beta asset.

Gold is commonly considered a hedge as its returns are uncorrelated to the return of market portfolio, interest rates, exchange rates, and inflation rates (He et al., 2018). This uncorrelation between gold and the market implies that gold may be a possible zero-beta asset. McCown and Zimmerman (2006) conclude that gold has similar mean return as the T-bills, implying that gold can provide a return that equals the more normally used risk-free rate. However, it is not strictly appropriate to state that gold return is the same as the risk-free rate because gold does not yield a return.

Although there is common acceptance that gold is an asset with a beta equal to zero (see O'Connor et al., 2015), it is still worth testing as a zero-beta asset in the zero-beta CAPM since the aforementioned research has some flaws in the implementation of their empirical tests.

Barring T-bills and gold, OIS and IBOR will be tested. An OIS is an interest rate swap over fixed terms with floating payment based on the return from a daily compound interest investment. The fixed rate of an OIS is an interest rate considered less risky than IBOR since the counterparty risk is less.

Hull and White (2013) discuss the derivatives discounting dilemma of using LIBOR or OIS in portfolio discounting. This discussion was raised by LCH. Clearnet announced in 2010 that they were discounting their \$218 trillion interest rate portfolios using OIS. A change followed with discounting collateralized transactions off the OIS and uncollateralized transactions off the LIBOR. They suggest that OIS discounting should be adopted by numerous markets. Evidently, OIS are considered a proxy for risk-free assets for different markets.

Furthermore, other literature related to OIS focuses on the discussion of whether major financial markets should adopt OIS instead of using IBOR (Smith 2013; Jakarasi et al, 2015). Smith (2013) finds that the switch from the LIBOR to OIS discounting in the valuation of collateralized interest rate swaps is more conceptual because it establishes the counterparty risk and LIBOR is no longer a reasonable proxy for the risk-free asset. Jakarasi et al. (2015) discuss whether the OIS discounting can be adopted in South Africa. However, the lack of consensus and inaccessibility of an overnight rate in South Africa prevent them from developing an OIS market. The key to their argument in both researches is based on the credit risk carried by the IBOR, which would affect the portfolio discounting. Effectively, OIS and IBOR are both considered proxies for the risk-free asset, despite IBOR carrying more credit risks in reality. Since LIBOR and OIS are considered proxies for the risk-free asset, we include OIS and IBOR in the tests and compare with gold and T-bills.

3. Data

Table 3-1 presents the descriptive data regarding the UK and US data on gold prices and three-month T-bills. The international benchmark of the gold price is set by the London Bullion Market Association. We use daily data for return on the government T-bills in the UK (1985–2019) and US markets (1972–2019). The returns on T-bills are selected from the daily data of the return on the three-months T-bills in the UK and US markets.

[Insert Table 3-1 here]

Table 3-2 provides the data of OIS in the UK, the US, and Japan and IBOR in China and India, including equity indices for all countries. Barring gold and T-bills, we choose OIS and

IBOR as other candidates of the proxy for the risk-free asset, since OIS is an alternative benchmark for the IBOR as the risk-free rate. However, there is no such benchmark for the OIS in China and India currently. We choose the IBOR in China and India as another candidate for the proxy for the risk-free asset instead of the missing data of the OIS and to compare with the OIS in the UK, the US, and Japan.

[Insert Table 3-2 here]

All data used are collected at a daily frequency. We choose five indices in five different countries, including the FTSE 350, S&P 500, SSE 180, NIKKEI 225, and SENSEX. All index constituents are used for each country and the complete list is available on request. As the start date of each constituent equity differs, we use the earliest starting date for each constituent. These five countries cover the mature markets for gold trading (the UK, the US, and Japan) and the emerging market of gold trading (China and India) (see Lucey et al. (2014) for a discussion about these markets).

Table 3-3 presents the descriptive statistics of the return of market indices in the five countries. The Jarque–Bera test examines whether the series are normally distributed. According to Table 3-3, it can be deduced that none of the series are normally distributed.

[Insert Table 3-3 here]

4. Methodology

4.1 Zero-beta CAPM and Wald test

The following equation presents the statistical model that is used to test the classic CAPM:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_i(R_{M,t} - R_{f,t}) + \varepsilon_{i,t} \quad (10)$$

where $i = 1, \dots, N; t = 1, \dots, T$,

$R_{i,t}$ = raw return on asset i in period t

$R_{M,t}$ = raw return on market portfolio m in period t

$R_{f,t}$ = raw return on the risk – free asset in period t

$\varepsilon_{i,t}$ = error term for asset i in period t

$\beta_i = \text{cov}(r_{i,t}, r_{m,t}) / \text{var}(r_{m,t})$

$N = \text{number of assets in the sample}$

$T = \text{number of periods in time series}$

The error terms $\varepsilon_{i,t}$ are assumed to be independent and identically distributed with mean zero and a constant variance–covariance matrix as follows:

$$E[\varepsilon_{is}\varepsilon_{jt}] = \begin{cases} \sigma_{ij}, & \text{if } s = t, j = i \\ 0, & s \neq t, j \neq i \end{cases} \quad (11)$$

The term α_i denotes an unknown constant for asset i , and β_i indicates the market risk coefficient for asset i .

Following Black's (1972) zero-beta CAPM, we assume that the risk-free rate is missing or unknown in the model, which is different from the classic CAPM shown in Equation (10). The zero-beta CAPM is written as follows:

$$E[R_{i,t}] - \gamma = \beta_i(E[R_{M,t}] - \gamma) \quad (12)$$

After rearrangement, we obtain the following:

$$E[R_{i,t}] = \gamma(1 - \beta_i) + \beta_i E[R_{M,t}] \quad (13)$$

where γ is an unknown constant that represents the expected return on a zero-beta asset since there is no risk-free asset. The zero-beta asset is uncorrelated to the underlying market portfolio m .

Let $R_{j,t}$ be the return on other assets, and asset j be the asset of gold, T-bills, OIS, or IBOR. To analyze in tests in the zero-beta CAPM, the parameter γ in Equation (13) is substituted by $E(R_{j,t})$. The core of this analysis is to use the expected return on asset j in the zero-beta CAPM. In other words, the expected return on the zero-beta asset is replaced by the expected return on asset j , implying that the expected return of asset j is assumed to be the return of the zero-beta asset in the zero-beta CAPM in Equation (14).

$$E[R_{i,t}] = E[R_{j,t}](1 - \beta_i) + \beta_i E[R_{m,t}] \quad (14)$$

To let the model in Equation (14) coincide with Equation (13), the null hypothesis is as follows:

$$H_0: \alpha_i = E[R_{j,t}](1 - \beta_i) \quad (15)$$

The null hypothesis can also be as follows, only if beta is not 1:

$$H_0: \frac{\alpha_i}{(1 - \beta_i)} = E[R_{j,t}] \quad (16)$$

against the alternative hypothesis:

$$H_A: \frac{\alpha_i}{(1 - \beta_i)} \neq E[R_{j,t}] \quad (17)$$

Since $i = 1, \dots, N$ and γ are unknown, there are $(N + 1)$ restrictions:

$$H_0' : \frac{\alpha_1}{(1 - \beta_1)} = \frac{\alpha_2}{(1 - \beta_2)} = \dots = \frac{\alpha_N}{(1 - \beta_N)} = E[R_{j,t}] \quad (18)$$

H_0' is another form of the null hypothesis. It puts a stricter requirement that Equation (18) must hold at the relevant significance level for gold, T-bills, OIS, or IBOR against each company in the five countries.

4.2 LRT in the zero-beta CAPM

As the Wald test is asymptotically equivalent to the LRT, the LRT in research is the alternative robustness test method to ensure that results are consistent. The zero-beta CAPM is the form in Equation (13).

$$E[r_{i,t}] = (1 - \beta_i)\gamma + \beta_i E[r_{m,t}] \quad (19)$$

The real return model of the zero-beta CAPM is Equation (20).

$$r_{i,t} = (1 - \beta_i)\gamma + \beta_i r_{m,t} + \varepsilon_t \quad (20)$$

$$E[\varepsilon_t \varepsilon_t'] = \Sigma \quad (21)$$

$$E[\varepsilon_t] = 0 \quad (22)$$

To start with the LRT on the zero-beta CAPM, the probability density function (PDF) of the real return is conditional on the return of market portfolios. Thus, the joint normality of returns for the PDF of $r_{i,t}$ is presented in the following equation:

$$f(r_{i,t} | r_{m,t}) = (2\pi)^{-\frac{N}{2}} |\Sigma|^{-\frac{1}{2}} \times \exp \left[-\frac{1}{2} (r_{i,t} - (1 - \beta_i)\gamma - \beta_i r_{m,t})' \Sigma^{-1} (r_{i,t} - (1 - \beta_i)\gamma - \beta_i r_{m,t}) \right] \quad (23)$$

Assume that there are N observations in the sample, then the joint PDF is as follows:

$$\begin{aligned}
& f(r_{1,t}, r_{2,t}, \dots, r_{Z,t} \mid r_{m1,t}, r_{m2,t}, \dots, r_{mZ,t}) \\
&= \prod_{z=1}^N p(r_{z,t} \mid r_{mz,t}) \\
&= \prod_{z=1}^N (2\pi)^{-\frac{N}{2}} |\Sigma|^{-\frac{1}{2}} \\
&\times \exp \left[-\frac{1}{2} (r_{z,t} - (1 - \beta_i)\gamma - \beta_i r_{mz,t})' \Sigma^{-1} (r_{z,t} - (1 - \beta_i)\gamma - \beta_i r_{mz,t}) \right] \quad (24)
\end{aligned}$$

As shown in Equation (23), the form of the PDF depends on the unknown parameters, γ, β , and Σ . Therefore, the log-likelihood function is defined as the logarithm of the joint PDF as in Equation (24), and $\mathcal{L}$ is denoted as the log-likelihood function. The log-likelihood function is as follows:

$$\begin{aligned}
\mathcal{L}(\gamma, \beta, \Sigma) &= -\frac{NZ}{2} \log(2\pi) - \frac{Z}{2} \log|\Sigma| \\
&- \frac{1}{2} \sum_{z=1}^Z (r_{z,t} - (1 - \beta_i)\gamma - \beta_i r_{mz,t})' \Sigma^{-1} (r_{z,t} - (1 - \beta_i)\gamma - \beta_i r_{mz,t}) \quad (25)
\end{aligned}$$

Differentiating Equation (25) with respect to γ, β , and Σ , the equations are as follows:

$$\frac{\partial \mathcal{L}}{\partial \gamma} = (1 - \beta_i)' \Sigma^{-1} \left[\sum_{z=1}^N (r_{z,t} - (1 - \beta_i)\gamma - \beta_i r_{mz,t}) \right] \quad (26)$$

$$\frac{\partial \mathcal{L}}{\partial \beta} = \Sigma^{-1} \left\{ \sum_{z=1}^N [(r_{z,t} - (1 - \beta_i)\gamma - \beta_i r_{mz,t})(r_{mz,t} - \gamma)'] \right\} \quad (27)$$

$$\frac{\partial \mathcal{L}}{\partial \Sigma} = -\frac{N}{2} \Sigma^{-1} + \frac{1}{2} \Sigma^{-1} \left\{ \sum_{z=1}^N [(r_{z,t} - (1 - \beta_i)\gamma - \beta_i r_{mz,t})(r_{mz,t} - \gamma)'] \right\} \Sigma^{-1} \quad (28)$$

To find the maximum likelihood estimators, Equations (26), (27), and (28) are set equal to zero.

$$\hat{\gamma}^* = \frac{(1 - \hat{\beta}^*)' \hat{\Sigma}^{*-1} (\hat{r}_i - \hat{\beta}^* \hat{r}_m)}{(1 - \hat{\beta}^*)' \hat{\Sigma}^{*-1} (1 - \hat{\beta}^*)} \quad (29)$$

$$\hat{\beta}^* = \frac{\sum_{z=1}^Z (r_{z,t} - \hat{\gamma}^*)(r_{mz,t} - \hat{\gamma}^*)}{\sum_{z=1}^Z (r_{mz,t} - \hat{\gamma}^*)^2} \quad (30)$$

$$\hat{\Sigma}^* = \frac{1}{N} \sum_{z=1}^N (r_{z,t} - \hat{\gamma}^*(1 - \hat{\beta}^*) - \hat{\beta}^* r_{mz,t}) (r_{z,t} - \hat{\gamma}^*(1 - \hat{\beta}^*) - \hat{\beta}^* r_{mz,t})' \quad (31)$$

The LRT follows the following null hypothesis:

$$H_0: \alpha_i = (1 - \beta_i)\gamma \quad (32)$$

$$H_A: \alpha_i \neq (1 - \beta_i)\gamma \quad (33)$$

Defining H as the test statistic, we have

$$H = Z[\log|\hat{\Sigma}^*| - \log|\hat{\Sigma}|] \xrightarrow{a} \chi_{N-1}^2 \quad (34)$$

According to Equation (34), the test aims to analyze whether the null distribution of H will relatively match the chi-square distribution. In other words, the test examines whether $Z[\log|\hat{\Sigma}^*| - \log|\hat{\Sigma}|]$ asymptotically matches the chi-square (χ^2) distribution with $(N-1)$ degree of freedom.

5. Empirical Results

5.1 ADF unit roots test results

Augmented Dickie Fuller (ADF) unit root tests have been undertaken for excess return of gold and rate of return in market portfolios in the five countries. The results in *Table 5-1* suggest that the null hypothesis is rejected for all variables. ADF unit root tests are run for all individual stocks used across the five countries. The results suggest that the null hypothesis is rejected for all stocks¹.

[Insert Table 5-1 here]

5.2 Results of the Wald test in the zero-beta CAPM

To test the zero-beta CAPM, raw individual stock price returns are used as the dependent variable in the regression with the raw returns of the market portfolios used as the explanatory variable. The hypothesis of the Wald test in the zero-beta CAPM is assumed to be $\frac{\alpha_i}{1-\beta_i} = \gamma$, assuming that the estimated α_i divided by one minus the estimated β_i equals the expected return of the zero-beta asset γ .

¹ Available on request.

The main objective is to test whether the asset used can be considered a zero-beta asset, which is to examine whether the p -value of the Wald test results for each stock is higher or lower than 0.05. If the probability of the Wald test is higher than 0.05, the null hypothesis of the Wald test cannot be rejected at that level, suggesting that the asset used in the test is a zero-beta asset. However, if the probability of the Wald test result is less than 0.05, the hypothesis is rejected, suggesting that this asset is not a zero-beta asset.

Tables A-1–A-5 report the results of the Wald test in the zero-beta CAPM for gold and T-bills in the five countries, OIS in the UK, the US, and Japan, and IBOR in China and India. *Table 5-2* summarizes these results showing the percentage of estimations that found that asset to be zero beta in that country. With the significance level at 95%, we conclude that an asset is zero-beta if 95% or more of the estimates are insignificant, for either the Wald test or LRT.

Gold is the most consistent performer across all countries with 96% of the Wald test runs on the UK equities and 98% of the Chinese equities identifying gold as a zero-beta asset.

T-bills only qualify as a risk-free asset in Japan with 96% of the individual regressions finding that T-bills were zero. They perform particularly poorly in the UK and qualify as a zero-beta asset very rarely, despite being the most commonly cited risk-free asset.

Only IBOR in China can be added to the possible lists of zero-beta assets, with 96% of the results for the individual equity regressions finding that it was zero beta.

[Insert Table 5-2 here]

The results in *Table 5-2* show that none of the assets examined are found to be consistently zero-beta/risk-free assets in all countries.

5.3 Robustness check: LRT

As shown above, the LRT is asymptotically equivalent to the Wald test. The LRT can be used as the robustness tool for checking the results of the Wald test in the zero-beta CAPM by testing whether the null distribution of H follows the chi-square distribution. We ran the LRT using each company in each country as the robustness check (*Tables A-6–A-10*). A summary is presented in *Table 5-2*. These results agree with the results from the Wald tests. Gold is the most consistent performer across all the countries, with T-bills only qualifying as a zero-beta asset in Japan, and IBOR in China.

6. Conclusion

This research investigates whether government gold, T-bills, OIS, and IBOR are zero-beta assets, which could then be used as proxies for risk-free assets in the UK, the US, China, Japan, and India under Black's (1972) zero-beta CAPM framework. We assume that gold, T-bills, OIS, or IBOR are a zero-beta asset in the zero-beta CAPM and apply the Wald test and LRT to examine whether the null hypothesis in the zero-beta CAPM can be rejected.

This is the first empirical test concerning whether any assets qualify as zero beta and thus as a proxy for the risk-free rate. We examine whether the assets qualify against companies in the FTSE 350, S&P 500, SSE 180, NIKKEI 225, and SENSEX in the zero-beta CAPM.

According to the results of the Wald tests and LRT, gold is a zero-beta asset in the UK and China; T-bills are a zero-beta asset in Japan; and IBOR is a zero-beta asset in China.

We can conclude that gold can be a proxy for the risk-free asset in the UK and China; T-bills in Japan; and IBOR in China. None of the OIS qualified as a zero-beta asset in the Wald test or LRT of the zero-beta CAPM, even though they are alternative benchmarks for the existing IBOR.

Instead of assuming what are risk-free assets, we show that there is no consistent asset across countries that can be considered zero-beta and thus a proxy for the risk-free rate in the CAPM. This issue has not been addressed enough in the literature, and specifying the risk-free rate when using the CAPM in empirical applications could greatly improve its usefulness.

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Figures and Tables

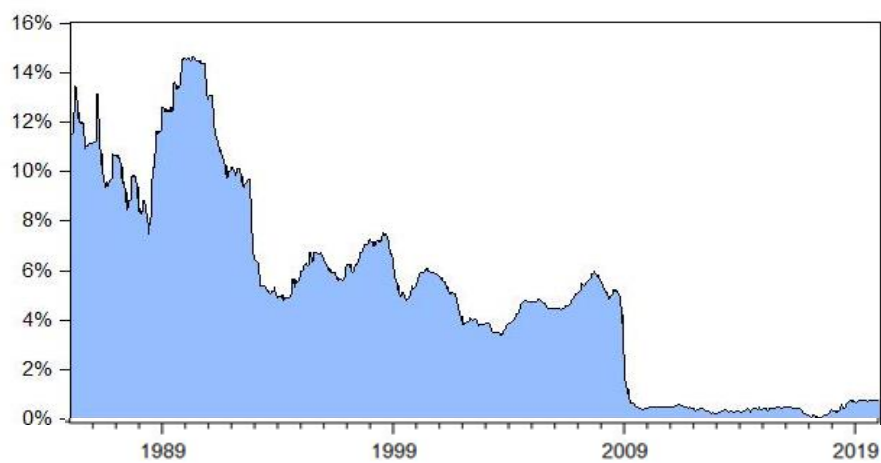


Fig. 1 The 3-months T-bills rate of return—UK

Table 3-1 Descriptive data of gold price and T-bills in the UK and US				
	UK		US	
	Gold price	3-months T-bills	Gold price	3-months T-bills
Mean	337.507	0.0139	534.215	0.0095
Std. Dev.	307.7565	0.00037	442.2512	0.0073
Skewness	1.280	0.4275	1.154	0.2240
Kurtosis	3.365	2.3721	3.1749	1.9921
Jarque-Bera	3614.57* [0.000]	413.18* [0.000]	2901.06* [0.000]	441.3* [0.000]
Observations	12966	9141	12977	12117
Note: * indicates the statistical significance at the 5% level.				

Table 3-2 Data of equity indices, OIS, and IBOR in the UK, the US, China, Japan, and India

	Start date	End date	Data Source
UK			
SONIA	03/24/1997	10/31/2019	Bank of England
FTSE 350	12/31/1985	10/31/2019	DataStream
US			
SOFR	04/03/2018	10/31/2019	FRED
S&P 500	01/02/1972	10/31/2019	DataStream
China			
IBOR	09/01/1988	10/31/2019	DataStream
SSE 180	01/02/1992	10/31/2019	DataStream
Japan			
TONA	11/12/2018	10/31/2019	DataStream
NIKKEI 225	04/03/1950	10/31/2019	DataStream
India			
IBOR	02/19/1996	10/31/2019	DataStream
SENSEX	04/03/1979	10/31/2019	DataStream

Note: We choose the earliest data for each equity index constituent.

Table 3-3 Descriptive statistics—Return of the market indices in the UK, the US, China, Japan, and India

	Mean	Std. Dev.	Skewness	Kurtosis	Jarque– Bera
FTSE 350	0.000457	0.010044	−2.15937	25.42477	30400*
S&P 500	0.000307	0.010236	−0.64904	24.71511	292377*
SSE 180	0.000596	0.024906	13.04389	540.0625	90961943*
NIKKEI	0.000369	0.0119	−0.17991	13.04102	77455*
SENSEX	0.000645	0.015053	0.341756	14.45369	59507*

Note: * presents the statistical significance at the 5% level in p -value.

Table 5-1 t-Statistics in augmented Dickey–Fuller unit
root test, daily data

	<i>t</i> -statistics (c)	<i>t</i> -statistics (c, t)	<i>t</i> -statistics (none)
UK			
Gold return	−89.3***	−89.3**	−89.3***
FTSE 350	−41.8***	−41.8***	−41.7***
US			
Gold return	−112.2***	−112.2**	−112.2**
S&P 500	−81.6***	−81.6***	−81.5***
China			
Gold return	−40.79**	−40.78**	−40.73**
SSE 180	−46.7**	−46.8**	−46.8**
Japan			
Gold return	−36.1**	−36.1**	−36.0**
NIKKEI 225	−70.8**	−70.9**	−70.8**
India			
Gold return	−60.5**	−60.4**	−60.5**
SENSEX	−89.0**	−89.1**	−89.0**

*Notes: the ADF unit root tests are applied in three ways with (c) as the only constant, (c, t) as a time trend and constant, and (none) as neither trend nor constant. The lag length is selected by the Schwarz information criterion. ** and *** present the statistical significance at the 5% and 1% levels in p -value, respectively.*

Table 5-2 The percentages of insignificant results in the Wald test and LRT for the UK, the US, China, Japan, and India, daily data

Asset	Wald Test	LRT
UK		
Gold	96%	97%
T-Bill	1%	5%
SONIA	2%	3%
US		
Gold	84%	90%
T-bill	9%	8%
SOFR	10%	10%
China		
Gold	98%	97%
T-bill	9%	9%
IBOR	96%	96%
Japan		
Gold	92%	90%
T-bill	96%	97%
TONAR	9%	10%
India		
Gold	83%	87%
T-bill	10%	13%
IBOR	7%	7%

Appendix

Table A-1 Wald Test Results (*p*-value for *t*-statistics) for Gold, T-bills, and SONIA in the UK

Code	Gold	T-bills	SONIA	Code	Gold	T-bills	SONIA
3IN	0.45	0.00*	0.00*	JAM	0.68	0.00*	0.00*
888	0.77	0.00*	0.00*	JD.	0.54	0.00*	0.00*
AAF	0.42	0.00*	0.00*	JDW	0.62	0.00*	0.00*
AAL	0.5	0.00*	0.38	JEO	0.79	0.00*	0.00*
ABF	0.83	0.00*	0.00*	JESC	0.32	0.00*	0.00*
ACI	0.62	0.00*	0.00*	JET	0.03*	0.00*	0.00*
ADM	0.24	0.00*	0.00*	JFJ	0.22	0.00*	0.00*
AGK	0.74	0.00*	0.00*	JLEN	0.37	0.00*	0.00*
AGR	0.16	0.00*	0.00*	JLG	0.56	0.00*	0.00*
AGT	0.11	0.00*	0.00*	JMAT	0.63	0.00*	0.00*
AHT	0.64	0.00*	0.00*	JMG	0.28	0.00*	0.00*
AJB	0.01*	0.57	0.00*	JUP	0.26	0.00*	0.00*
AML	0.95	0.00*	0.00*	JUST	0.66	0.00*	0.00*
ANTO	0.91	0.00*	0.00*	KAZ	0.13	0.00*	0.00*
AO.	0.9	0.00*	0.00*	KGF	0.83	0.00*	0.00*
APAX	0.88	0.00*	0.00*	KNOS	0.71	0.00*	0.00*
ASCL	0.55	0.00*	0.00*	LAND	0.1	0.00*	0.00*
ASHM	0.69	0.00*	0.00*	LGEN	0.11	0.00*	0.00*
ASL	0.37	0.00*	0.00*	LIO	0.11	0.00*	0.00*
ATST	0.69	0.00*	0.00*	LLOY	0.28	0.00*	0.00*
ATT	0.47	0.00*	0.00*	LMP	0.83	0.00*	0.00*
AUTO	0.89	0.00*	0.00*	LRE	0.15	0.00*	0.00*
AV.	0.84	0.00*	0.00*	LSE	0.46	0.00*	0.00*
AVON	0.77	0.00*	0.00*	LWDB	0.7	0.00*	0.00*
AVST	0.97	0.00*	0.94	LXI	0.14	0.00*	0.00*
AVV	0.6	0.00*	0.00*	MAB	0.2	0.00*	0.00*
AZN	0.42	0.00*	0.00*	MCRO	0.44	0.00*	0.00*
BA.	0.68	0.00*	0.00*	MDC	0.54	0.00*	0.00*

BAB	0.09	0.00*	0.00*	MGAM	0.66	0.00*	0.00*
BARC	0.85	0.00*	0.00*	MGGT	0.24	0.00*	0.00*
BATS	0.49	0.00*	0.00*	MGNS	0.77	0.00*	0.00*
BBGI	0.39	0.00*	0.00*	MKS	0.97	0.00*	0.00*
BBH	0.63	0.00*	0.00*	MNDI	0.9	0.00*	0.00*
BBOX	0.34	0.00*	0.00*	MNG	0.82	0.00*	0.00*
BBY	0.67	0.00*	0.00*	MNKS	0.7	0.00*	0.00*
BCPT	0.59	0.00*	0.00*	MONY	0.68	0.00*	0.00*
BDEV	0.11	0.00*	0.00*	MRC	0.13	0.00*	0.00*
BEZ	0.63	0.00*	0.00*	MRO	0.43	0.00*	0.00*
BGFD	0.29	0.00*	0.00*	MRW	0.58	0.00*	0.00*
BGS	0.57	0.00*	0.00*	MSLH	0.27	0.00*	0.00*
BGSC	0.09	0.00*	0.00*	MYI	0.34	0.00*	0.00*
BHP	0.48	0.00*	0.00*	N91	0.48	0.00*	0.00*
BIFF	0.34	0.00*	0.00*	NESF	0.92	0.00*	0.00*
BKG	0.01*	0.00*	0.00*	NETW	0.43	0.00*	0.00*
BLND	0.53	0.00*	0.00*	NEX	0.14	0.00*	0.00*
BME	0.86	0.00*	0.00*	NG.	0.15	0.00*	0.00*
BNKR	0.29	0.00*	0.00*	NWG	0.47	0.00*	0.00*
BNZL	0.21	0.00*	0.00*	NXT	0.82	0.00*	0.00*
BOY	0.07	0.00*	0.00*	OCDO	0.66	0.00*	0.00*
BP.	0.77	0.00*	0.00*	OSB	0.96	0.00*	0.00*
BRBY	0.65	0.00*	0.00*	OXB	0.96	0.00*	0.00*
BRSC	0.83	0.00*	0.00*	OXIG	0.97	0.00*	0.00*
BRW	0.17	0.98	0.00*	PAG	0.86	0.00*	0.00*
BRWM	0.45	0.00*	0.00*	PAGE	0.9	0.00*	0.00*
BT.A	0.15	0.00*	0.00*	PCT	0.4	0.00*	0.00*
BVIC	0.22	0.00*	0.00*	PETS	0.35	0.00*	0.00*
BWY	0.67	0.00*	0.00*	PFC	0.6	0.00*	0.00*
BYG	0.8	0.00*	0.00*	PFD	0.76	0.00*	0.00*
CAPC	0.45	0.00*	0.00*	PFG	0.95	0.00*	0.00*
CBG	0.15	0.00*	0.00*	PHNX	0.29	0.27	0.00*

CCC	0.22	0.00*	0.00*	PHP	0.59	0.00*	0.00*
CCH	0.67	0.00*	0.87	PIN	0.97	0.00*	0.00*
CCL	0.79	0.00*	0.00*	PLI	0.72	0.00*	0.00*
CCR	0.39	0.00*	0.00*	PLP	0.01*	0.00*	0.00*
CEY	0.32	0.00*	0.00*	PLUS	0.32	0.00*	0.00*
CHG	0.34	0.00*	0.00*	PNL	0.66	0.00*	0.55
CINE	0.38	0.00*	0.00*	PNN	0.47	0.00*	0.00*
CKN	0.56	0.00*	0.00*	POG	0.35	0.00*	0.00*
CLDN	0.78	0.00*	0.00*	POLY	0.53	0.00*	0.00*
CLI	0.32	0.00*	0.00*	PRTC	0.81	0.00*	0.00*
CLSN	0.68	0.00*	0.00*	PRU	0.21	0.00*	0.00*
CMCX	0.15	0.00*	0.00*	PSH	0.2	0.00*	0.00*
CAN	0.57	0.00*	0.00*	PSN	0.75	0.00*	0.00*
CNE	0.00*	0.00*	0.00*	PERSON	0.07	0.00*	0.00*
COA	0.75	0.00*	0.00*	PTEC	0.53	0.00*	0.00*
CPG	0.06	0.00*	0.00*	PZC	0.69	0.00*	0.00*
CPI	0.32	0.00*	0.00*	QLT	0.22	0.00*	0.00*
CRDA	0.37	0.00*	0.00*	QQ.	0.38	0.00*	0.00*
CRH	0.77	0.00*	0.00*	RAT	0.86	0.00*	0.00*
CRST	0.16	0.00*	0.00*	RB.	0.82	0.00*	0.00*
CSH	0.88	0.00*	0.00*	RCP	0.45	0.00*	0.00*
CSP	0.47	0.00*	0.00*	RDSA	0.67	0.00*	0.00*
CTEC	0.54	0.00*	0.00*	RDSB	0.67	0.00*	0.00*
CTY	0.36	0.00*	0.00*	RDW	0.23	0.00*	0.00*
CWK	0.47	0.00*	0.00*	REL	0.78	0.00*	0.00*
DC.	0.36	0.00*	0.00*	RHIM	0.24	0.00*	0.00*
DCC	0.87	0.00*	0.00*	RIO	0.45	0.00*	0.00*
DGE	0.68	0.00*	0.00*	RMG	0.8	0.00*	0.00*
DGOC	0.19	0.00*	0.00*	RMV	0.63	0.00*	0.00*
DIGS	0.68	0.00*	0.00*	RNK	0.26	0.38	0.00*
DLG	0.37	0.00*	0.00*	ROR	0.39	0.00*	0.00*
DLN	0.48	0.00*	0.00*	RR.	0.14	0.00*	0.00*

DNLM	0.67	0.00*	0.00*	RSA	0.81	0.00*	0.00*
DOM	0.22	0.00*	0.00*	RSW	0.62	0.00*	0.00*
DPH	0.97	0.00*	0.00*	RTO	0.57	0.00*	0.00*
DPLM	0.34	0.00*	0.00*	SAFE	0.25	0.00*	0.00*
DRX	0.68	0.00*	0.00*	SAIN	0.39	0.00*	0.00*
ECM	0.37	0.00*	0.00*	SBRE	0.36	0.00*	0.00*
EDIN	0.98	0.00*	0.00*	SBRY	0.98	0.00*	0.00*
EMG	0.25	0.00*	0.00*	SCIN	0.32	0.00*	0.00*
ENOG	0.07	0.00*	0.00*	SCT	0.37	0.00*	0.00*
ERM	0.67	0.00*	0.00*	SDP	0.19	0.00*	0.67
ESNT	0.62	0.00*	0.00*	SDR	0.69	0.00*	0.00*
EVR	0.34	0.00*	0.00*	SEQI	0.86	0.00*	0.00*
EWI	0.29	0.00*	0.00*	SGE	0.99	0.00*	0.00*
EXPN	0.79	0.00*	0.00*	SGRO	0.17	0.00*	0.00*
EZJ	0.31	0.00*	0.00*	SHB	0.81	0.00*	0.00*
FCIT	0.1	0.00*	0.00*	SIG	0.22	0.00*	0.00*
FCSS	0.92	0.00*	0.00*	SKG	0.24	0.00*	0.00*
FDM	0.45	0.00*	0.00*	SLA	0.61	0.00*	0.00*
FERG	0.21	0.00*	0.00*	SMDS	0.24	0.00*	0.00*
FEV	0.37	0.00*	0.00*	SMIN	0.68	0.00*	0.00*
FGP	0.19	0.00*	0.00*	SMP	0.01*	0.00*	0.00*
FGT	0.67	0.00*	0.00*	SMT	0.99	0.00*	0.00*
FLTR	0.59	0.00*	0.00*	SMWH	0.31	0.00*	0.00*
FOUR	0.66	0.00*	0.00*	SN.	0.31	0.00*	0.00*
FRAS	0.37	0.00*	0.00*	SNN	0.67	0.00*	0.00*
FRES	0.24	0.00*	0.00*	SOI	0.99	0.00*	0.00*
FSFL	0.59	0.00*	0.00*	SONC	0.11	0.00*	0.00*
FSJ	0.99	0.00*	0.00*	SONG	0.89	0.00*	0.00*
FSV	0.77	0.00*	0.00*	SPT	0.55	0.00*	0.00*
FUTR	0.01*	0.00*	0.00*	SPX	0.42	0.00*	0.00*
FXPO	0.65	0.00*	0.00*	SRE	0.2	0.00*	0.00*
GAW	0.52	0.00*	0.00*	SRP	0.84	0.00*	0.00*

GCP	0.48	0.00*	0.00*	SSE	0.87	0.00*	0.00*
GFS	0.97	0.00*	0.00*	SSON	0.88	0.00*	0.98
GFTU	0.66	0.00*	0.00*	SSPG	0.94	0.00*	0.00*
GLEN	0.72	0.00*	0.00*	STAN	0.37	0.00*	0.00*
GLO	0.59	0.00*	0.00*	STJ	0.25	0.00*	0.00*
GNC	0.78	0.00*	0.00*	SVS	0.99	0.00*	0.00*
GNS	0.14	0.00*	0.00*	SVT	0.2	0.00*	0.00*
GPOR	0.82	0.00*	0.00*	SXS	0.54	0.00*	0.00*
GRG	0.59	0.00*	0.00*	SYNC	0.96	0.00*	0.00*
GRI	0.75	0.00*	0.00*	SYNT	0.29	0.00*	0.00*
GSK	0.69	0.00*	0.00*	TALK	0.61	0.00*	0.00*
GSS	0.95	0.00*	0.00*	TATE	0.37	0.00*	0.00*
GVC	0.58	0.00*	0.00*	TBCG	0.83	0.00*	0.00*
GYS	0.58	0.00*	0.00*	TCAP	0.58	0.00*	0.00*
HAS	0.01*	0.00*	0.00*	TEM	0.48	0.00*	0.00*
HFG	0.78	0.00*	0.00*	TEP	0.3	0.00*	0.00*
HGT	0.56	0.00*	0.00*	TIFS	0.42	0.00*	0.00*
HICL	0.46	0.00*	0.00*	TPK	0.81	0.00*	0.00*
HIK	0.16	0.00*	0.00*	TRIG	0.96	0.00*	0.00*
HILS	0.13	0.00*	0.00*	TRN	0.65	0.00*	0.00*
HL.	0.52	0.00*	0.00*	TRY	0.16	0.00*	0.00*
HLMA	0.42	0.00*	0.00*	TSCO	0.45	0.00*	0.00*
HOC	0.17	0.00*	0.00*	TUI	0.71	0.00*	0.00*
HRI	0.61	0.00*	0.00*	TW.	0.59	0.00*	0.00*
HSBA	0.86	0.00*	0.00*	UDG	0.68	0.00*	0.00*
HSL	0.75	0.00*	0.00*	UKCM	0.74	0.00*	0.00*
HSTG	0.94	0.00*	0.00*	UKW	0.17	0.00*	0.00*
HSV	0.25	0.00*	0.00*	ULE	0.27	0.00*	0.00*
HSX	0.6	0.00*	0.00*	ULVR	0.4	0.00*	0.00*
HTWS	0.7	0.00*	0.00*	USA	0.23	0.00*	0.00*
HVPE	0.81	0.00*	0.00*	UTG	0.15	0.00*	0.00*
HWDN	0.76	0.00*	0.00*	UU.	0.1	0.00*	0.00*

IAG	0.17	0.00*	0.00*	VCT	0.95	0.00*	0.00*
IBST	0.57	0.00*	0.00*	VEC	0.59	0.00*	0.00*
ICGT	0.83	0.00*	0.00*	VEIL	0.17	0.00*	0.00*
ICP	0.98	0.00*	0.00*	VMUK	0.92	0.00*	0.00*
IEM	0.01*	0.00*	0.00*	VOD	0.26	0.00*	0.00*
IGG	0.76	0.00*	0.00*	VOF	0.49	0.00*	0.00*
IHG	0.19	0.00*	0.00*	VSVS	0.97	0.00*	0.00*
IHP	0.93	0.00*	0.00*	VTY	0.01*	0.00*	0.00*
III	0.16	0.00*	0.00*	VVO	0.68	0.00*	0.00*
IMB	0.44	0.00*	0.00*	WEIR	0.75	0.00*	0.00*
IMI	0.71	0.00*	0.00*	WG.	0.23	0.00*	0.00*
INCH	0.01*	0.00*	0.00*	WIZZ	0.22	0.00*	0.00*
INDV	0.61	0.00*	0.00*	WKP	0.78	0.00*	0.00*
INF	0.27	0.00*	0.00*	WMH	0.33	0.00*	0.00*
INPP	0.87	0.00*	0.00*	WOSG	0.58	0.00*	0.00*
INVP	0.21	0.00*	0.00*	WPP	0.66	0.00*	0.00*
IPO	0.01*	0.00*	0.00*	WTAN	0.53	0.00*	0.00*
ITRK	0.3	0.00*	0.00*	WTB	0.01*	0.00*	0.00*
ITV	0.64	0.00*	0.00*	WWH	0.32	0.00*	0.00*
IWG	0.77	0.00*	0.00*	XPP	0.84	0.00*	0.00*

Table A-2 Wald Test Results (p-value for t-statistics) for Gold, T-bills, and SOFR in the US

Code	Gold	T-bills	SOFR	Code	Gold	T-bills	SOFR
ATVI	0.45	0.00*	0.00*	MTD	0.85	0.00*	0.00*
GOOGL	0.52	0.00*	0.71	MYL	0.79	0.00*	0.00*
GOOG	0.52	0.16	0.00*	PKI	0.46	0.00*	0.00*
T	0.9	0.00*	0.00*	PRGO	0.04*	0.00*	0.16
CTL	0.01*	0.00*	0.00*	PFE	0.13	0.39	0.00*
CHTR	0.96	0.00*	0.00*	DGX	0.00*	0.00*	0.68
CMCSA	0.38	0.34	0.54	REGN	0.01*	0.00*	0.00*
DISCA	0.02*	0.00*	0.00*	RMD	0.91	0.00*	0.00*
DISCK	0.24	0.00*	0.00*	STE	0.2	0.00*	0.00*
DISH	0.24	0.00*	0.00*	SYK	0.4	0.00*	0.00*
EA	0.18	0.00*	0.00*	TFX	0.16	0.00*	0.00*
FB	0.69	0.41	0.75	COO	0.00*	0.79	0.76
FOXA	0.00*	0.00*	0.00*	TMO	0.12	0.00*	0.00*
FOX	0.96	0.00*	0.00*	UNH	0.54	0.00*	0.00*
IPG	0.57	0.00*	0.00*	UHS	0.79	0.00*	0.00*
LYV	0.28	0.00*	0.88	VAR	0.75	0.00*	0.00*
NFLX	0.69	0.00*	0.00*	VRTX	0.43	0.00*	0.00*
NWSA	0.34	0.76	0.00*	WAT	0.23	0.00*	0.00*
NWS	0.19	0.00*	0.00*	WST	0.01*	0.62	0.00*
OMC	0.41	0.00*	0.00*	ZBH	0.18	0.00*	0.00*
TMUS	0.91	0.00*	0.00*	ZTS	0.00*	0.00*	0.33
TTWO	0.47	0.00*	0.00*	MMM	0.54	0.00*	0.00*
DIS	0.36	0.68	0.00*	AOS	0.45	0.00*	0.00*
TWTR	0.01*	0.00*	0.00*	ALK	0.62	0.00*	0.00*
VZ	0.76	0.00*	0.89	ALLE	0.98	0.00*	0.00*
VIAC	0.33	0.00*	0.00*	AAL	0.01*	0.00*	0.00*
AAP	0.56	0.00*	0.00*	AME	0.17	0.00*	0.00*
AMZN	0.67	0.00*	0.00*	BA	0.27	0.00*	0.00*
APTV	0.00*	0.00*	0.00*	CHRW	0.95	0.00*	0.00*

AZO	0.79	0.00*	0.00*	CARR	0.39	0.00*	0.00*
BBY	0.16	0.52	0.00*	CAT	0.12	0.16	0.26
BKNG	0.63	0.00*	0.00*	CTAS	0.79	0.00*	0.00*
BWA	0.7	0.00*	0.00*	CPRT	0.33	0.00*	0.00*
KMX	0.68	0.00*	0.36	CSX	0.91	0.00*	0.00*
CCL	0.18	0.00*	0.00*	CMI	0.00*	0.00*	0.00*
CMG	0.32	0.00*	0.00*	DE	0.52	0.00*	0.00*
DHI	0.82	0.00*	0.00*	DAL	0.03*	0.00*	0.00*
DRI	0.4	0.00*	0.00*	DOV	0.46	0.00*	0.00*
DG	0.00*	0.09	0.00*	ETN	0.09	0.00*	0.51
DLTR	0.64	0.00*	0.53	EMR	0.47	0.00*	0.00*
DPZ	0.1	0.00*	0.00*	EFX	0.8	0.00*	0.00*
EBAY	0.43	0.00*	0.00*	EXPD	0.1	0.00*	0.00*
EXPE	0.22	0.24	0.00*	FAST	0.27	0.00*	0.00*
F	0.73	0.00*	0.00*	FDX	0.16	0.00*	0.00*
GPS	0.91	0.00*	0.00*	FLS	0.78	0.00*	0.00*
GRMN	0.66	0.00*	0.00*	FTV	0.01*	0.63	0.00*
GM	0.63	0.49	0.00*	FBHS	0.26	0.00*	0.00*
GPC	0.28	0.00*	0.00*	GD	0.47	0.00*	0.00*
HRB	0.32	0.00*	0.00*	GE	0.67	0.00*	0.00*
HBI	0.00*	0.00*	0.00*	GWV	0.89	0.00*	0.00*
HAS	0.07	0.00*	0.00*	HON	0.00*	0.00*	0.00*
HLT	0.63	0.00*	0.00*	HWM	0.7	0.00*	0.00*
HD	0.92	0.00*	0.00*	HII	0.53	0.00*	0.00*
KSS	0.37	0.00*	0.00*	IEX	0.21	0.00*	0.00*
LB	0.00*	0.08	0.94	INFO	0.47	0.00*	0.00*
LVS	0.31	0.00*	0.00*	ITW	0.00*	0.00*	0.00*
LEG	0.34	0.00*	0.00*	IR	0.72	0.00*	0.05
LEN	0.77	0.00*	0.00*	JBHT	0.17	0.00*	0.00*
LKQ	0.84	0.00*	0.00*	J	0.27	0.00*	0.00*
LOW	0.83	0.00*	0.00*	JCI	0.84	0.00*	0.00*
MAR	0.28	0.00*	0.00*	KSU	0.02*	0.49	0.00*

MCD	0.86	0.00*	0.00*	LHX	0.55	0.00*	0.00*
MGM	0.28	0.00*	0.00*	LMT	0.85	0.00*	0.00*
MHK	0.29	0.00*	0.00*	MAS	0.73	0.00*	0.00*
NWL	0.18	0.00*	0.00*	NLSN	0.19	0.00*	0.00*
NKE	0.01*	0.00*	0.00*	NSC	0.07	0.00*	0.00*
NCLH	0.63	0.95	0.22	NOC	0.00*	0.00*	0.00*
NVR	0.78	0.00*	0.00*	ODFL	0.33	0.00*	0.00*
ORLY	0.22	0.00*	0.00*	OTIS	0.31	0.00*	0.00*
PHM	0.88	0.00*	0.00*	PCAR	0.01*	0.00*	0.00*
PVH	0.52	0.00*	0.00*	PH	0.2	0.00*	0.00*
RL	0.46	0.00*	0.00*	PNR	0.00*	0.00*	0.89
ROST	0.00*	0.00*	0.24	PWR	0.19	0.00*	0.00*
RCL	0.16	0.00*	0.00*	RTX	0.75	0.00*	0.00*
SBUX	0.94	0.00*	0.00*	RSG	0.29	0.00*	0.65
TPR	0.73	0.58	0.24	RHI	0.83	0.81	0.00*
TGT	0.91	0.00*	0.00*	ROK	0.4	0.00*	0.00*
TIF	0.15	0.00*	0.00*	ROL	0.11	0.00*	0.00*
TJX	0.67	0.00*	0.00*	ROP	0.1	0.00*	0.00*
TSCO	0.06	0.00*	0.00*	SNA	0.00*	0.00*	0.00*
ULTA	0.1	0.00*	0.00*	LUV	0.89	0.00*	0.00*
UAA	0.27	0.00*	0.42	SWK	0.57	0.00*	0.00*
UA	0.16	0.00*	0.00*	TDY	0.45	0.00*	0.00*
VFC	0.77	0.00*	0.00*	TXT	0.2	0.00*	0.00*
WHR	0.4	0.29	0.00*	TT	0.39	0.00*	0.00*
WYNN	0.45	0.00*	0.00*	TDG	0.8	0.00*	0.00*
YUM	0.26	0.00*	0.00*	UNP	0.21	0.00*	0.00*
MO	0.23	0.00*	0.00*	UAL	0.27	0.00*	0.41
ADM	0.68	0.00*	0.00*	UPS	0.74	0.00*	0.00*
BF.B	0.01*	0.00*	0.00*	URI	0.68	0.00*	0.00*
CPB	0.83	0.00*	0.00*	VRSK	0.8	0.59	0.00*
CHD	0.64	0.00*	0.00*	WAB	0.01*	0.00*	0.00*
KO	0.29	0.00*	0.00*	WM	0.87	0.00*	0.37

CL	0.61	0.73	0.00*	XYL	0.32	0.00*	0.00*
CAG	0.62	0.00*	0.00*	ACN	0.26	0.00*	0.00*
STZ	0.00*	0.00*	0.00*	ADBE	0.00*	0.00*	0.00*
COST	0.18	0.00*	0.07	AMD	0.11	0.00*	0.00*
COTY	0.68	0.00*	0.00*	AKAM	0.24	0.00*	0.00*
EL	0.44	0.00*	0.00*	APH	0.71	0.00*	0.00*
GIS	0.69	0.41	0.00*	ADI	0.55	0.00*	0.00*
HRL	0.65	0.00*	0.00*	ANSS	0.00*	0.00*	0.61
SJM	0.89	0.00*	0.00*	AAPL	0.61	0.00*	0.00*
K	0.73	0.00*	0.00*	AMAT	0.63	0.00*	0.00*
KMB	0.75	0.00*	0.00*	ANET	0.89	0.00*	0.23
KHC	0.72	0.00*	0.00*	ADSK	0.97	0.00*	0.00*
KR	0.42	0.9	0.00*	ADP	0.78	0.51	0.00*
LW	0.49	0.00*	0.00*	AVGO	0.32	0.00*	0.00*
MKC	0.77	0.00*	0.00*	BR	0.99	0.00*	0.85
TAP	0.22	0.00*	0.00*	CDNS	0.89	0.00*	0.00*
MDLZ	0.23	0.00*	0.00*	CDW	0.87	0.00*	0.00*
MNST	0.00*	0.00*	0.00*	CSCO	0.4	0.00*	0.00*
PEP	0.81	0.00*	0.00*	CTXS	0.77	0.00*	0.00*
PM	0.79	0.00*	0.00*	CTSH	0.28	0.00*	0.00*
PG	0.36	0.00*	0.00*	GLW	0.7	0.00*	0.00*
SYY	0.92	0.52	0.24	DXC	0.34	0.00*	0.00*
CLX	0.66	0.00*	0.00*	FFIV	0.75	0.00*	0.00*
HSY	0.54	0.00*	0.00*	FIS	0.1	0.00*	0.00*
TSN	0.32	0.00*	0.00*	FISV	0.85	0.00*	0.00*
WBA	0.88	0.00*	0.00*	FLT	0.00*	0.00*	0.72
WMT	0.85	0.00*	0.00*	FLIR	0.17	0.00*	0.00*
APA	0.72	0.54	0.00*	FTNT	0.54	0.00*	0.00*
BKR	0.35	0.00*	0.00*	IT	0.78	0.00*	0.00*
COG	0.81	0.00*	0.00*	GPN	0.94	0.00*	0.00*
CVX	0.63	0.00*	0.00*	HPE	0.21	0.48	0.00*
CXO	0.00*	0.00*	0.00*	HPQ	0.00*	0.00*	0.92

COP	0.68	0.81	0.00*	INTC	0.96	0.00*	0.00*
DVN	0.23	0.00*	0.00*	IBM	0.38	0.00*	0.00*
FANG	0.74	0.00*	0.00*	INTU	0.61	0.00*	0.00*
EOG	0.41	0.00*	0.00*	IPGP	0.37	0.00*	0.00*
XOM	0.45	0.00*	0.00*	JKHY	0.68	0.00*	0.00*
HAL	0.78	0.00*	0.00*	JNPR	0.00*	0.00*	0.00*
HES	0.01*	0.00*	0.00*	KEYS	0.6	0.00*	0.00*
HFC	0.62	0.66	0.00*	KLAC	0.76	0.00*	0.00*
KMI	0.87	0.00*	0.00*	LRCX	0.15	0.00*	0.00*
MRO	0.78	0.00*	0.00*	LDOS	0.94	0.00*	0.00*
MPC	0.94	0.00*	0.92	MA	0.00*	0.48	0.00*
NOV	0.22	0.00*	0.00*	MXIM	0.4	0.00*	0.76
NBL	0.24	0.00*	0.00*	MCHP	0.25	0.00*	0.00*
OXY	0.99	0.85	0.00*	MU	0.09	0.00*	0.00*
OKE	0.33	0.00*	0.00*	MSFT	0.27	0.00*	0.00*
PSX	0.00*	0.00*	0.00*	MSI	0.00*	0.00*	0.00*
PXD	0.52	0.00*	0.00*	NTAP	0.85	0.00*	0.00*
SLB	0.63	0.00*	0.00*	NLOK	0.89	0.00*	0.00*
FTI	0.42	0.00*	0.00*	NVDA	0.68	0.00*	0.00*
VLO	0.62	0.00*	0.00*	ORCL	0.44	0.00*	0.00*
WMB	0.16	0.00*	0.00*	PAYX	0.07	0.00*	0.00*
AFL	0.53	0.00*	0.00*	PAYC	0.42	0.00*	0.00*
ALL	0.47	0.00*	0.00*	PYPL	0.00*	0.18	0.00*
AXP	0.48	0.00*	0.00*	QRVO	0.25	0.00*	0.19
AIG	0.49	0.00*	0.00*	QCOM	0.65	0.00*	0.00*
AMP	0.85	0.00*	0.6	CRM	0.61	0.00*	0.00*
AON	0.57	0.00*	0.00*	STX	0.13	0.00*	0.91
AJG	0.00*	0.00*	0.00*	NOW	0.63	0.00*	0.00*
AIZ	0.55	0.45	0.00*	SWKS	0.18	0.00*	0.00*
BAC	0.32	0.00*	0.00*	SNPS	0.00*	0.00*	0.00*
BRK.B	0.54	0.00*	0.00*	TEL	0.28	0.00*	0.00*
BLK	0.18	0.00*	0.9	TXN	0.57	0.00*	0.00*

COF	0.19	0.00*	0.00*	TYL	0.59	0.00*	0.00*
CBOE	0.88	0.00*	0.00*	VRSN	0.32	0.00*	0.00*
SCHW	0.39	0.00*	0.00*	V	0.37	0.00*	0.00*
CB	0.94	0.00*	0.00*	WDC	0.82	0.00*	0.00*
CINF	0.00*	0.00*	0.00*	WU	0.18	0.00*	0.00*
C	0.84	0.00*	0.00*	XRX	0.00*	0.82	0.00*
CFG	0.94	0.00*	0.00*	XLNX	0.55	0.00*	0.00*
CME	0.98	0.00*	0.00*	ZBRA	0.06	0.00*	0.00*
CMA	0.96	0.00*	0.92	APD	0.27	0.00*	0.00*
DFS	0.00*	0.00*	0.00*	ALB	0.04*	0.00*	0.00*
ETFC	0.63	0.00*	0.00*	AMCR	0.88	0.00*	0.00*
RE	0.22	0.00*	0.00*	AVY	0.14	0.00*	0.00*
FITB	0.3	0.00*	0.00*	BLL	0.86	0.00*	0.95
FRC	0.96	0.00*	0.00*	CE	0.76	0.00*	0.00*
BEN	0.47	0.44	0.00*	CF	0.96	0.00*	0.00*
GL	0.57	0.00*	0.00*	CTVA	0.00*	0.00*	0.00*
GS	0.7	0.00*	0.00*	DOW	0.54	0.00*	0.00*
HIG	0.42	0.00*	0.00*	DD	0.84	0.08	0.99
HBAN	0.9	0.00*	0.00*	EMN	0.06	0.00*	0.00*
ICE	0.45	0.00*	0.00*	ECL	0.46	0.00*	0.00*
IVZ	0.5	0.00*	0.4	FMC	0.43	0.00*	0.00*
JPM	0.94	0.00*	0.00*	FCX	0.00*	0.00*	0.00*
KEY	0.48	0.00*	0.00*	IFF	0.55	0.00*	0.00*
LNC	0.00*	0.00*	0.00*	IP	0.44	0.00*	0.00*
L	0.65	0.00*	0.00*	LIN	0.01*	0.00*	0.00*
MTB	0.85	0.00*	0.5	LYB	0.06	0.00*	0.00*
MKTX	0.93	0.00*	0.00*	MLM	0.83	0.00*	0.00*
MMC	0.01*	0.00*	0.00*	NEM	0.93	0.00*	0.8
MET	0.32	0.00*	0.00*	NUE	0.36	0.00*	0.00*
MCO	0.64	0.00*	0.00*	PKG	0.00*	0.00*	0.00*
MS	0.46	0.00*	0.00*	PPG	0.34	0.00*	0.00*
MSCI	0.54	0.00*	0.00*	SEE	0.77	0.00*	0.00*

NDAQ	0.67	0.00*	0.36	SHW	0.94	0.00*	0.00*
NTRS	0.81	0.00*	0.00*	MOS	0.85	0.00*	0.00*
PBCT	0.07	0.00*	0.00*	VMC	0.27	0.00*	0.00*
PNC	0.00*	0.00*	0.00*	WRK	0.96	0.00*	0.00*
PFG	0.69	0.00*	0.00*	ARE	0.00*	0.00*	0.00*
PGR	0.22	0.00*	0.00*	AMT	0.96	0.00*	0.00*
PRU	0.65	0.00*	0.00*	AIV	0.00*	0.00*	0.00*
RJF	0.14	0.00*	0.00*	AVB	0.91	0.00*	0.00*
RF	0.32	0.00*	0.00*	BXP	0.44	0.00*	0.00*
SPGI	0.00*	0.00*	0.00*	CBRE	0.66	0.00*	0.00*
STT	0.07	0.00*	0.00*	CCI	0.00*	0.00*	0.00*
SIVB	0.27	0.00*	0.00*	DLR	0.35	0.00*	0.00*
SYF	0.14	0.00*	0.00*	DRE	0.23	0.00*	0.00*
TROW	0.83	0.00*	0.00*	EQIX	0.85	0.00*	0.53
BK	0.28	0.00*	0.00*	EQR	0.18	0.00*	0.00*
TRV	0.88	0.00*	0.00*	ESS	0.86	0.00*	0.00*
TFC	0.29	0.00*	0.00*	EXR	0.00*	0.00*	0.00*
USB	0.13	0.00*	0.00*	FRT	0.08	0.00*	0.00*
UNM	0.89	0.00*	0.3	PEAK	0.33	0.00*	0.00*
WRB	0.1	0.00*	0.00*	HST	0.82	0.00*	0.00*
WFC	0.83	0.00*	0.00*	IRM	0.00*	0.00*	0.00*
WLTW	0.00*	0.00*	0.00*	KIM	0.98	0.00*	0.00*
ZION	0.61	0.00*	0.00*	MAA	0.22	0.00*	0.00*
ABT	0.23	0.00*	0.00*	PLD	0.93	0.00*	0.00*
ABBV	0.91	0.00*	0.00*	PSA	0.7	0.00*	0.00*
ABMD	0.1	0.00*	0.00*	O	0.47	0.00*	0.00*
A	0.82	0.00*	0.00*	REG	0.17	0.00*	0.00*
ALXN	0.45	0.00*	0.00*	SBAC	0.00*	0.00*	0.00*
ALGN	0.98	0.00*	0.00*	SPG	0.64	0.00*	0.00*
ABC	0.00*	0.00*	0.00*	SLG	0.68	0.00*	0.00*
AMGN	0.27	0.00*	0.00*	UDR	0.93	0.00*	0.00*
ANTM	0.01*	0.37	0.00*	VTR	0.36	0.00*	0.89

BAX	0.37	0.00*	0.00*	VNO	0.37	0.00*	0.00*
BDX	0.8	0.00*	0.41	WELL	0.00*	0.08	0.00*
BIO	0.59	0.00*	0.00*	WY	0.77	0.00*	0.00*
BIIB	0.00*	0.00*	0.00*	Symbol	0.00*	0.00*	0.00*
BSX	0.81	0.00*	0.00*	AES	0.29	0.00*	0.00*
BMY	0.23	0.00*	0.00*	LNT	0.6	0.00*	0.00*
CAH	0.56	0.00*	0.00*	AEE	0.01*	0.00*	0.00*
CNC	0.91	0.00*	0.00*	AEP	0.86	0.00*	0.00*
CERN	0.83	0.00*	0.00*	AWK	0.82	0.18	0.00*
CI	0.74	0.00*	0.00*	ATO	0.72	0.00*	0.00*
CVS	0.00*	0.00*	0.00*	CNP	0.00*	0.00*	0.00*
DHR	0.49	0.00*	0.00*	CMS	0.9	0.00*	0.00*
DVA	0.56	0.00*	0.00*	ED	0.17	0.00*	0.00*
XRAY	0.01*	0.00*	0.37	D	0.81	0.00*	0.00*
DXCM	0.7	0.00*	0.00*	DTE	0.99	0.00*	0.00*
EW	0.62	0.00*	0.00*	DUK	0.23	0.00*	0.00*
GILD	0.9	0.00*	0.00*	EIX	0.33	0.00*	0.00*
HCA	0.77	0.00*	0.00*	ETR	0.57	0.00*	0.06
HSIC	0.00*	0.00*	0.00*	EVRG	0.00*	0.00*	0.00*
HOLX	0.62	0.00*	0.00*	ES	0.76	0.00*	0.00*
HUM	0.14	0.00*	0.00*	EXC	0.16	0.00*	0.00*
IDXX	0.56	0.00*	0.00*	FE	0.85	0.00*	0.00*
ILMN	0.00*	0.00*	0.00*	NEE	0.00*	0.00*	0.00*
INCY	0.97	0.00*	0.00*	NI	0.79	0.84	0.00*
ISRG	0.07	0.2	0.00*	NRG	0.83	0.00*	0.00*
IQV	0.8	0.00*	0.00*	PNW	0.87	0.00*	0.00*
JNJ	0.46	0.00*	0.00*	PPL	0.01*	0.00*	0.00*
LH	0.47	0.00*	0.00*	PEG	0.77	0.00*	0.00*
LLY	0.00*	0.00*	0.57	SRE	0.00*	0.67	0.00*
MCK	0.67	0.38	0.00*	SO	0.22	0.00*	0.42
MDT	0.27	0.00*	0.00*	WEC	0.00*	0.00*	0.00*
MRK	0.47	0.00*	0.00*	XEL	0.14	0.00*	0.00*

Table A-3 Wald Test Results (p-value for t-statistics) for Gold, T-bills, and IBOR in China

Code	Gold	T-bills	IBOR	Code	Gold	T-bills	IBOR
600000	0.08	0.00*	0.99	600895	0.15	0.00*	0.99
600004	0.7	0.00*	0.71	600900	0.48	0.00*	0.17
600009	0.77	0.00*	0.13	600909	0.24	0.00*	0.39
600010	0.89	0.16	0.39	600919	0.29	0.00*	0.91
600011	0.59	0.00*	0.31	600926	0.75	0.00*	0.2
600015	0.49	0.00*	0.08	600928	0.63	0.00*	0.3
600016	0.64	0.00*	0.76	600958	0.12	0.00*	0.77
600018	0.56	0.00*	0.01*	600968	0.36	0.00*	0.8
600019	0.41	0.00*	0.92	600977	0.94	0.00*	0.01*
600025	0.87	0.00*	0.53	600989	0.27	0.00*	0.49
600028	0.66	0.21	0.33	600999	0.43	0.00*	0.16
600029	0.63	0.00*	0.41	601006	0.1	0.00*	0.43
600030	0.1	0.00*	0.52	601009	0.18	0.79	0.81
600031	0.83	0.00*	0.3	601012	0.73	0.00*	0.28
600036	0.51	0.45	0.68	601021	0.42	0.00*	0.16
600038	0.42	0.00*	0.46	601066	0.66	0.00*	0.34
600048	0.46	0.00*	0.15	601077	0.85	0.00*	0.63
600050	0.54	0.00*	0.22	601088	0.68	0.00*	0.88
600061	0.96	0.14	0.14	601099	0.42	0.00*	0.23
600066	0.45	0.00*	0.41	601100	0.62	0.00*	0.17
600068	0.83	0.00*	0.42	601108	0.75	0.00*	0.84
600085	0.19	0.00*	0.75	601111	0.53	0.00*	0.66
600089	0.78	0.00*	0.11	601138	0.26	0.00*	0.32
600104	0.59	0.00*	0.33	601155	0.19	0.00*	0.99
600109	0.98	0.00*	0.02*	601162	0.84	0.00*	0.2
600111	0.18	0.00*	0.65	601166	0.78	0.00*	0.2
600115	0.73	0.00*	0.18	601169	0.83	0.00*	0.04*
600118	0.01*	0.00*	0.26	601186	0.83	0.00*	0.24
600150	0.82	0.00*	0.54	601198	0.11	0.00*	0.35

600155	0.96	0.00*	0.74	601211	0.84	0.00*	0.97
600176	0.23	0.00*	0.36	601225	0.24	0.00*	0.36
600177	0.11	0.00*	0.39	601229	0.54	0.00*	0.17
600183	0.15	0.00*	0.54	601233	0.15	0.00*	0.23
600196	0.82	0.00*	0.2	601236	0.4	0.00*	0.68
600201	0.36	0.00*	0.3	601238	0.6	0.57	0.73
600208	0.48	0.00*	0.2	601288	0.15	0.00*	0.39
600271	0.51	0.17	0.64	601318	0.31	0.00*	0.95
600276	0.28	0.00*	0.61	601319	0.02*	0.00*	0.2
600298	0.45	0.00*	0.99	601328	0.64	0.00*	0.87
600309	0.57	0.00*	0.48	601336	0.96	0.00*	0.41
600332	0.29	0.00*	0.48	601377	0.86	0.00*	0.95
600340	0.94	0.00*	0.99	601390	0.1	0.00*	0.92
600346	0.44	0.00*	0.88	601398	0.46	0.00*	0.76
600352	0.51	0.00*	0.84	601519	0.98	0.00*	0.78
600362	0.1	0.00*	0.88	601555	0.28	0.00*	0.69
600383	0.59	0.00*	0.41	601601	0.43	0.00*	0.12
600406	0.15	0.00*	0.3	601607	0.49	0.00*	0.16
600436	0.58	0.00*	0.67	601618	0.35	0.00*	0.77
600438	0.65	0.49	0.89	601628	0.82	0.00*	0.92
600487	0.61	0.00*	0.64	601633	0.06	0.38	0.79
600489	0.57	0.00*	0.68	601658	0.22	0.00*	0.83
600516	0.87	0.00*	0.47	601668	0.99	0.00*	0.41
600519	0.07	0.00*	0.53	601669	0.64	0.00*	0.72
600521	0.39	0.00*	0.02*	601688	0.55	0.00*	0.68
600522	0.47	0.00*	0.57	601698	0.91	0.00*	0.79
600536	0.95	0.00*	0.73	601766	0.78	0.00*	0.58
600547	0.44	0.00*	0.08	601788	0.53	0.00*	0.52
600570	0.11	0.00*	0.92	601800	0.49	0.00*	0.23
600572	0.8	0.00*	0.95	601816	0.51	0.00*	0.49
600585	0.37	0.00*	0.06	601818	0.57	0.00*	0.25
600588	0.77	0.00*	0.81	601857	0.47	0.00*	0.19

600598	0.97	0.00*	0.13	601860	0.29	0.00*	0.01*
600600	0.17	0.00*	0.84	601872	0.51	0.00*	0.97
600604	0.57	0.72	0.84	601877	0.63	0.00*	0.6
600606	0.14	0.00*	0.58	601878	0.72	0.00*	0.87
600621	0.98	0.00*	0.04*	601881	0.65	0.00*	0.22
600637	0.97	0.00*	0.46	601888	0.89	0.00*	0.85
600660	0.28	0.00*	0.26	601899	0.18	0.92	0.33
600690	0.12	0.00*	0.23	601901	0.65	0.00*	0.63
600699	0.79	0.00*	0.76	601916	0.11	0.00*	0.37
600703	0.83	0.00*	0.09	601933	0.07	0.00*	0.18
600705	0.79	0.00*	0.64	601939	0.83	0.00*	0.88
600733	0.62	0.00*	0.43	601985	0.04*	0.00*	0.76
600737	0.5	0.00*	0.6	601988	0.49	0.00*	0.1
600741	0.52	0.00*	0.34	601989	0.66	0.00*	0.08
600745	0.12	0.64	0.96	601990	0.4	0.00*	0.96
600760	0.01*	0.00*	0.6	601998	0.09	0.00*	0.24
600763	0.19	0.00*	0.76	603019	0.32	0.00*	0.32
600779	0.22	0.00*	0.98	603160	0.62	0.00*	0.39
600795	0.85	0.00*	0.18	603259	0.79	0.00*	0.65
600801	0.12	0.00*	0.83	603288	0.65	0.00*	0.01*
600809	0.79	0.00*	0.97	603369	0.39	0.00*	0.98
600837	0.11	0.00*	0.85	603501	0.59	0.17	0.64
600848	0.9	0.00*	0.81	603517	0.8	0.23	0.67
600867	0.58	0.00*	0.89	603589	0.6	0.00*	0.16
600872	0.73	0.00*	0.12	603799	0.09	0.00*	0.08
600875	0.37	0.00*	0.06	603833	0.45	0.00*	0.86
600886	0.1	0.61	0.23	603983	0.32	0.00*	0.96
600887	0.68	0.00*	0.9	603986	0.82	0.00*	0.22
600893	0.57	0.00*	0.09	603993	0.61	0.53	0.91

Table A-4 Wald Test Results (p-value for t-statistics) for Gold, T-bills, and TONA in Japan

Code	Gold	T-bills	TONA	Code	Gold	T-bills	TONA
4503	0.61	0.52	0.00*	1605	0.16	0.08	0.00*
4519	0.82	0.49	0.00*	3401	0.59	0.64	0.00*
4568	0.27	0.02*	0.49	3402	0.29	0.65	0.88
4506	0.23	0.45	0.00*	3101	0.75	0.68	0.00*
4523	0.15	0.56	0.00*	3103	0.54	0.35	0.00*
4151	0.01*	0.07	0.00*	3863	0.09	0.12	0.00*
4578	0.23	0.13	0.00*	3861	0.63	0.02*	0.00*
4507	0.5	0.93	0.7	3407	0.98	0.19	0.00*
4502	0.16	0.57	0.00*	4061	0.4	0.48	0.00*
6857	0.56	0.79	0.00*	4631	0.48	0.33	0.29
6770	0.12	0.04*	0.00*	4901	0.04*	0.59	0.00*
7751	0.56	0.67	0.87	4452	0.98	0.74	0.00*
6952	0.33	0.52	0.00*	3405	0.14	0.29	0.00*
7735	0.75	0.02*	0.00*	4188	0.72	0.4	0.00*
6902	0.12	0.47	0.00*	4183	0.56	0.34	0.00*
6954	0.24	0.45	0.71	4021	0.84	0.68	0.35
6504	0.5	0.16	0.00*	6988	0.63	0.97	0.00*
6702	0.59	0.23	0.00*	4063	0.7	0.63	0.00*
6674	0.24	0.64	0.00*	4911	0.01*	0.55	0.00*
6501	0.98	0.77	0.00*	4004	0.17	0.11	0.00*
6971	0.99	0.21	0.00*	4005	0.72	0.33	0.00*
6479	0.02*	0.76	0.63	4043	0.6	0.02*	0.00*
6503	0.52	0.27	0.00*	4042	0.74	0.2	0.14
6701	0.11	0.55	0.00*	4208	0.58	0.56	0.00*
3105	0.74	0.86	0.00*	5020	0.8	0.88	0.00*
6703	0.8	0.47	0.00*	5019	0.39	0.87	0.00*
6645	0.37	0.68	0.00*	5108	0.4	0.04*	0.00*
6752	0.16	0.23	0.41	5101	0.51	0.86	0.00*
7752	0.41	0.99	0.00*	5201	0.3	0.97	0.00*

6724	0.79	0.33	0.00*	5333	0.77	0.27	0.00*
6758	0.07	0.14	0.00*	5214	0.48	0.25	0.00*
6976	0.18	0.77	0.00*	5202	0.65	0.45	0.00*
6762	0.98	0.03*	0.00*	5232	0.19	0.74	0.00*
8035	0.58	0.27	0.00*	5233	0.44	0.24	0.00*
6506	0.33	0.91	0.00*	5301	0.96	0.26	0.00*
6841	0.46	0.56	0.00*	5332	0.86	0.75	0.00*
7205	0.69	0.19	0.15	5411	0.98	0.79	0.00*
7267	0.68	0.52	0.00*	5406	0.01*	0.16	0.00*
7202	0.93	0.89	0.00*	5401	0.43	0.9	0.00*
7261	0.33	0.15	0.00*	5541	0.81	0.17	0.00*
7211	0.87	0.17	0.00*	5714	0.07	0.02*	0.15
7201	0.39	0.78	0.00*	5803	0.45	0.31	0.00*
7270	0.14	0.15	0.71	5801	0.72	0.4	0.00*
7269	0.17	0.41	0.00*	5711	0.84	0.71	0.00*
7203	0.38	0.04*	0.00*	5706	0.79	0.79	0.00*
7272	0.2	0.65	0.00*	5703	0.37	0.44	0.00*
7762	0.81	0.91	0.00*	3436	0.36	0.62	0.00*
4902	0.46	0.6	0.00*	5802	0.00*	0.32	0.00*
7731	0.01*	0.73	0.00*	5713	0.64	0.22	0.00*
7733	0.18	0.83	0.00*	5707	0.5	0.39	0.00*
4543	0.44	0.47	0.00*	5901	0.62	0.99	0.00*
9433	0.74	0.19	0.73	8001	0.16	0.92	0.00*
9432	0.99	0.68	0.00*	8002	0.07	0.79	0.00*
9613	0.89	0.75	0.00*	8058	0.57	0.48	0.00*
9437	0.37	0.37	0.00*	8031	0.36	0.8	0.00*
9412	0.4	0.56	0.00*	2768	0.68	0.53	0.00*
9434	0.74	0.76	0.00*	8053	0.02*	0.55	0.00*
9984	0.97	0.46	0.00*	8015	0.58	0.19	0.00*
8304	0.59	0.92	0.00*	1721	0.97	0.87	0.83
8331	0.64	0.73	0.00*	1925	0.7	0.16	0.00*
7186	0.73	0.81	0.00*	1808	0.27	0.47	0.00*

8309	0.85	0.35	0.00*	1963	0.15	0.16	0.00*
8354	0.09	0.93	0.00*	1812	0.69	0.22	0.00*
8306	0.97	0.84	0.27	1802	0.25	0.96	0.00*
8411	0.21	0.37	0.00*	1928	0.54	0.17	0.00*
8308	0.89	0.55	0.00*	1803	0.21	0.27	0.00*
8303	0.69	0.45	0.00*	1801	0.31	0.89	0.00*
8355	0.61	0.19	0.00*	6113	0.02*	0.87	0.00*
8316	0.51	0.94	0.00*	6367	0.96	0.99	0.00*
8253	0.95	0.47	0.00*	6367	0.41	0.62	0.00*
8697	0.95	0.87	0.00*	6305	0.52	0.2	0.00*
8601	0.04*	0.52	0.00*	7004	0.83	0.93	0.00*
8628	0.92	0.7	0.00*	7013	0.81	0.6	0.00*
8604	0.63	0.57	0.00*	5631	0.43	0.81	0.00*
8750	0.49	0.59	0.00*	6473	0.22	0.98	0.00*
8725	0.17	0.4	0.00*	6301	0.83	0.61	0.00*
8630	0.77	0.75	0.00*	6326	0.44	0.12	0.00*
8795	0.78	0.47	0.00*	7011	0.74	0.76	0.05
8766	0.01*	0.95	0.00*	6471	0.7	0.47	0.00*
1332	0.25	0.38	0.00*	6472	0.49	0.21	0.00*
1333	0.97	0.33	0.00*	6103	0.08	0.74	0.00*
2802	0.63	0.94	0.00*	6302	0.65	0.06	0.00*
2502	0.96	0.26	0.12	7012	0.26	0.2	0.00*
2914	0.43	0.25	0.00*	7003	0.31	0.31	0.00*
2801	0.03*	0.96	0.00*	7832	0.67	0.58	0.00*
2503	0.19	0.49	0.00*	7912	0.41	0.61	0.00*
2269	0.83	0.84	0.00*	7911	0.85	0.16	0.00*
2871	0.75	0.81	0.00*	7951	0.9	0.56	0.00*
2282	0.87	0.34	0.00*	8802	0.22	0.75	0.00*
2002	0.94	0.74	0.00*	8801	0.61	0.8	0.00*
2501	0.35	0.37	0.00*	8830	0.21	0.73	0.00*
2531	0.38	0.54	0.00*	8804	0.28	0.62	0.00*
8267	0.06	0.19	0.00*	3289	0.05*	0.61	0.00*

8028	0.27	0.89	0.00*	9022	0.34	0.65	0.00*
9983	0.03*	0.43	0.00*	9020	0.07	0.24	0.00*
3099	0.49	0.87	0.00*	9008	0.3	0.57	0.38
3086	0.83	0.92	0.00*	9009	0.99	0.46	0.00*
8252	0.7	0.33	0.00*	9007	0.69	0.38	0.00*
3382	0.24	0.06	0.00*	9001	0.32	0.43	0.00*
8233	0.47	0.44	0.00*	9005	0.97	0.76	0.00*
4751	0.11	0.75	0.00*	9021	0.77	0.85	0.00*
2432	0.55	0.27	0.00*	9062	0.33	0.37	0.00*
4324	0.32	0.75	0.00*	9064	0.13	0.13	0.00*
6178	0.01*	0.85	0.18	9107	0.02*	0.46	0.00*
9766	0.11	0.89	0.00*	9104	0.17	0.65	0.00*
2413	0.44	0.9	0.00*	9101	0.21	0.07	0.00*
4755	0.28	0.44	0.00*	9302	0.79	0.55	0.00*
6098	0.09	0.7	0.00*	9301	0.06	0.39	0.00*
9735	0.78	0.54	0.00*	9502	0.55	0.06	0.00*
9602	0.67	0.67	0.00*	9503	0.86	0.91	0.36
4704	0.13	0.16	0.00*	9501	0.65	0.87	0.00*
4689	0.48	0.86	0.00*	9532	0.56	0.44	0.00*
				9531	0.88	0.74	0.00*

Table A-5 Wald Test Results (p-value for t-statistics) for Gold, T-bills, and IBOR in India

Code	Gold	T-bills	IBOR
500820	0.01*	0.01*	0.00*
532215	0.09	0.00*	0.00*
532977	0.75	0.00*	0.00*
500034	0.1	0.00*	0.01*
532978	0.52	0.75	0.03*
532454	0.45	0.00*	0.04*
532281	0.63	0.00*	0.00*
500010	0.08	0.00*	0.00*
500180	0.6	0.00*	0.00*
500696	0.07	0.00*	0.00*
532174	0.25	0.00*	0.00*
532187	0.38	0.66	0.00*
500209	0.01*	0.00*	0.00*
500875	0.05*	0.00*	0.00*
500247	0.13	0.00*	0.00*
500510	0.2	0.00*	0.00*
500520	0.23	0.00*	0.02*
532500	0.29	0.31	0.00*
500790	0.04*	0.00*	0.17
532555	0.39	0.00*	0.01*
500312	0.53	0.00*	0.54
532898	0.86	0.00*	0.00*
500325	0.07	0.00*	0.00*
500112	0.16	0.00*	0.00*
524715	0.95	0.00*	0.02*
500470	0.99	0.00*	0.00*
532540	0.52	0.00*	0.00*
532755	0.62	0.00*	0.00*
500114	0.02*	0.00*	0.00*

532538	0.57	0.00*	0.00*
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Table A-6 LRT Results (p-value for t-statistics) for Gold, T-bills, SONIA in UK

Code	Gold	T-bills	SONIA	Code	Gold	T-bills	SONIA
3IN	0.23	0.00*	0.00*	JAM	0.33	0.00*	0.00*
888	0.51	0.00*	0.00*	JD.	0.99	0.00*	0.00*
AAF	0.29	0.00*	0.00*	JDW	0.56	0.00*	0.00*
AAL	0.11	0.00*	0.66	JEO	0.89	0.00*	0.00*
ABF	0.52	0.00*	0.00*	JESC	0.47	0.00*	0.00*
ACI	0.06	0.00*	0.00*	JET	0.03*	0.00*	0.00*
ADM	0.23	0.87	0.00*	JFJ	0.71	0.00*	0.00*
AGK	0.2	0.00*	0.00*	JLEN	0.11	0.00*	0.00*
AGR	0.92	0.00*	0.00*	JLG	0.2	0.00*	0.00*
AGT	0.76	0.00*	0.00*	JMAT	0.17	0.00*	0.00*
AHT	0.57	0.00*	0.00*	JMG	0.52	0.00*	0.00*
AJB	0.01*	0.96	0.00*	JUP	0.35	0.00*	0.00*
AML	0.61	0.00*	0.00*	JUST	0.22	0.00*	0.00*
ANTO	0.48	0.00*	0.00*	KAZ	0.06	0.36	0.00*
AO.	0.89	0.00*	0.00*	KGF	0.79	0.00*	0.00*
APAX	0.16	0.00*	0.00*	KNOS	0.69	0.00*	0.00*
ASCL	0.41	0.00*	0.00*	LAND	0.84	0.00*	0.00*
ASHM	0.42	0.00*	0.00*	LGEN	0.82	0.00*	0.00*
ASL	0.21	0.00*	0.00*	LIO	0.08	0.00*	0.00*
ATST	0.35	0.00*	0.00*	LLOY	0.97	0.00*	0.00*
ATT	0.87	0.00*	0.00*	LMP	0.95	0.00*	0.00*
AUTO	0.86	0.00*	0.00*	LRE	0.55	0.00*	0.00*
AV.	0.32	0.00*	0.00*	LSE	0.53	0.00*	0.00*
AVON	0.16	0.00*	0.00*	LWDB	0.43	0.00*	0.00*
AVST	0.13	0.00*	0.23	LXI	0.15	0.00*	0.00*
AVV	0.44	0.00*	0.00*	MAB	0.22	0.00*	0.00*
AZN	0.46	0.00*	0.00*	MCRO	0.47	0.00*	0.00*
BA.	0.77	0.00*	0.00*	MDC	0.93	0.00*	0.00*

BAB	0.83	0.00*	0.00*	MGAM	0.99	0.00*	0.00*
BARC	0.4	0.00*	0.00*	MGGT	0.66	0.00*	0.00*
BATS	0.07	0.00*	0.00*	MGNS	0.73	0.00*	0.00*
BBGI	0.71	0.00*	0.00*	MKS	0.62	0.00*	0.00*
BBH	0.51	0.93	0.00*	MNDI	0.6	0.00*	0.00*
BBOX	0.36	0.00*	0.00*	MNG	0.7	0.00*	0.00*
BBY	0.17	0.00*	0.00*	MNKS	0.54	0.00*	0.00*
BCPT	0.75	0.00*	0.00*	MONY	0.85	0.00*	0.00*
BDEV	0.09	0.00*	0.00*	MRC	0.11	0.00*	0.00*
BEZ	0.8	0.00*	0.00*	MRO	0.53	0.00*	0.00*
BGFD	0.58	0.00*	0.00*	MRW	0.82	0.00*	0.00*
BGS	0.62	0.00*	0.00*	MSLH	0.89	0.00*	0.00*
BGSC	0.7	0.00*	0.00*	MYI	0.32	0.00*	0.00*
BHP	0.6	0.00*	0.00*	N91	0.36	0.00*	0.00*
BIFF	0.59	0.00*	0.00*	NESF	0.51	0.00*	0.00*
BKG	0.01*	0.00*	0.00*	NETW	0.54	0.00*	0.00*
BLND	0.67	0.00*	0.00*	NEX	0.41	0.00*	0.00*
BME	0.59	0.00*	0.00*	NG.	0.94	0.00*	0.00*
BNKR	0.92	0.00*	0.00*	NWG	0.44	0.06	0.00*
BNZL	0.3	0.00*	0.00*	NXT	0.72	0.00*	0.00*
BOY	0.13	0.00*	0.00*	OCDO	0.55	0.00*	0.00*
BP.	0.67	0.00*	0.00*	OSB	0.63	0.00*	0.00*
BRBY	0.85	0.00*	0.00*	OXB	0.86	0.00*	0.00*
BRSC	0.49	0.00*	0.00*	OXIG	0.89	0.00*	0.00*
BRW	0.65	0.74	0.00*	PAG	0.99	0.00*	0.00*
BRWM	0.09	0.00*	0.00*	PAGE	0.96	0.00*	0.00*
BT.A	0.11	0.00*	0.00*	PCT	0.34	0.00*	0.00*
BVIC	0.3	0.00*	0.00*	PETS	0.92	0.00*	0.00*
BWY	0.8	0.00*	0.00*	PFC	0.24	0.00*	0.00*
BYG	0.8	0.00*	0.00*	PFD	0.55	0.00*	0.00*
CAPC	0.37	0.00*	0.00*	PFG	0.06	0.00*	0.00*
CBG	0.52	0.00*	0.00*	PHNX	0.82	0.9	0.00*

CCC	0.86	0.00*	0.00*	PHP	0.37	0.00*	0.00*
CCH	0.7	0.00*	0.71	PIN	0.28	0.00*	0.00*
CCL	0.48	0.00*	0.00*	PLI	0.29	0.00*	0.00*
CCR	0.63	0.00*	0.00*	PLP	0.01*	0.00*	0.00*
CEY	0.69	0.00*	0.00*	PLUS	0.33	0.00*	0.00*
CHG	0.73	0.00*	0.00*	PNL	0.81	0.00*	0.84
CINE	0.8	0.00*	0.00*	PNN	0.82	0.00*	0.00*
CKN	0.7	0.11	0.00*	POG	0.14	0.00*	0.00*
CLDN	0.79	0.00*	0.00*	POLY	0.15	0.00*	0.00*
CLI	0.5	0.00*	0.00*	PRTC	0.26	0.00*	0.00*
CLSN	0.78	0.00*	0.00*	PRU	0.17	0.00*	0.00*
CMCX	0.56	0.00*	0.00*	PSH	0.6	0.00*	0.00*
CAN	0.57	0.00*	0.00*	PSN	0.69	0.00*	0.00*
CNE	0.00*	0.00*	0.00*	PERSON	0.86	0.00*	0.00*
COA	0.73	0.00*	0.00*	PTEC	0.82	0.00*	0.00*
CPG	0.06	0.00*	0.00*	PZC	0.55	0.00*	0.00*
CPI	0.09	0.00*	0.00*	QLT	0.17	0.23	0.00*
CRDA	0.94	0.00*	0.00*	QQ.	0.11	0.00*	0.00*
CRH	0.75	0.72	0.00*	RAT	0.52	0.00*	0.00*
CRST	0.32	0.00*	0.00*	RB.	0.43	0.00*	0.00*
CSH	0.18	0.00*	0.00*	RCP	0.2	0.00*	0.00*
CSP	0.69	0.00*	0.00*	RDSA	0.37	0.00*	0.00*
CTEC	0.3	0.00*	0.00*	RDSB	0.28	0.00*	0.00*
CTY	0.1	0.00*	0.00*	RDW	0.46	0.00*	0.00*
CWK	0.76	0.00*	0.00*	REL	0.45	0.00*	0.00*
DC.	0.93	0.00*	0.00*	RHIM	0.72	0.00*	0.00*
DCC	0.37	0.00*	0.00*	RIO	0.76	0.00*	0.00*
DGE	0.86	0.00*	0.00*	RMG	0.79	0.00*	0.00*
DGOC	0.82	0.00*	0.00*	RMV	0.7	0.00*	0.00*
DIGS	0.94	0.00*	0.37	RNK	0.07	0.45	0.00*
DLG	0.3	0.00*	0.00*	ROR	0.12	0.00*	0.00*
DLN	0.45	0.54	0.00*	RR.	0.78	0.00*	0.00*

DNLM	0.98	0.00*	0.00*	RSA	0.42	0.00*	0.00*
DOM	0.89	0.00*	0.00*	RSW	0.24	0.00*	0.00*
DPH	0.06	0.00*	0.00*	RTO	0.78	0.00*	0.00*
DPLM	0.96	0.00*	0.00*	SAFE	0.59	0.00*	0.00*
DRX	0.15	0.00*	0.00*	SAIN	0.74	0.00*	0.00*
ECM	0.11	0.00*	0.00*	SBRE	0.35	0.6	0.00*
EDIN	0.44	0.00*	0.00*	SBRY	0.57	0.00*	0.00*
EMG	0.62	0.00*	0.00*	SCIN	0.46	0.00*	0.00*
ENOG	0.41	0.00*	0.00*	SCT	0.84	0.00*	0.00*
ERM	0.13	0.00*	0.00*	SDP	0.18	0.00*	0.44
ESNT	0.51	0.00*	0.00*	SDR	0.48	0.00*	0.00*
EVR	0.25	0.00*	0.00*	SEI	0.3	0.00*	0.00*
EWI	0.26	0.92	0.00*	SGE	0.59	0.00*	0.00*
EXPN	0.07	0.00*	0.00*	SGRO	0.33	0.00*	0.00*
EZJ	0.98	0.00*	0.00*	SHB	0.14	0.00*	0.00*
FCIT	0.69	0.00*	0.00*	SIG	0.94	0.00*	0.00*
FCSS	0.48	0.00*	0.00*	SKG	0.98	0.00*	0.00*
FDM	0.61	0.00*	0.00*	SLA	0.43	0.00*	0.00*
FERG	0.37	0.00*	0.99	SMDS	0.35	0.00*	0.00*
FEV	0.97	0.00*	0.00*	SMIN	0.97	0.00*	0.00*
FGP	0.1	0.00*	0.00*	SMP	0.01*	0.00*	0.00*
FGT	0.67	0.00*	0.00*	SMT	0.07	0.00*	0.00*
FLTR	0.78	0.00*	0.00*	SMWH	0.23	0.00*	0.00*
FOUR	0.96	0.00*	0.00*	SN.	0.19	0.00*	0.00*
FRAS	0.78	0.00*	0.00*	SNN	0.46	0.00*	0.00*
FRES	0.97	0.00*	0.00*	SOI	0.66	0.00*	0.00*
FSFL	0.34	0.00*	0.00*	SONC	0.87	0.94	0.00*
FSJ	0.9	0.00*	0.00*	SONG	0.85	0.00*	0.00*
FSV	0.89	0.00*	0.00*	SPT	0.29	0.00*	0.00*
FUTR	0.01*	0.00*	0.00*	SPX	0.39	0.00*	0.00*
FXPO	0.5	0.00*	0.00*	SRE	0.53	0.00*	0.00*
GAW	0.09	0.00*	0.00*	SRP	0.11	0.00*	0.00*

GCP	0.53	0.00*	0.00*	SSE	0.31	0.00*	0.00*
GFS	0.71	0.00*	0.00*	SSON	0.99	0.00*	0.99
GFTU	0.2	0.00*	0.00*	SSPG	0.33	0.00*	0.00*
GLEN	0.68	0.00*	0.00*	STAN	0.59	0.00*	0.00*
GLO	0.94	0.00*	0.00*	STJ	0.9	0.00*	0.00*
GNC	0.2	0.00*	0.00*	SVS	0.39	0.00*	0.00*
GNS	0.87	0.00*	0.00*	SVT	0.7	0.00*	0.00*
GPOR	0.44	0.00*	0.00*	SXS	0.73	0.00*	0.00*
GRG	0.55	0.00*	0.00*	SYNC	0.7	0.00*	0.00*
GRI	0.65	0.00*	0.00*	SYNT	0.58	0.00*	0.00*
GSK	0.6	0.00*	0.00*	TALK	0.98	0.00*	0.00*
GSS	0.21	0.00*	0.00*	TATE	0.89	0.00*	0.00*
GVC	0.99	0.00*	0.00*	TBCG	0.86	0.00*	0.00*
GYS	0.97	0.00*	0.00*	TCAP	0.38	0.00*	0.00*
HAS	0.38	0.00*	0.00*	TEM	0.65	0.00*	0.00*
HFG	0.94	0.00*	0.69	TEP	0.94	0.00*	0.00*
HGT	0.79	0.00*	0.00*	TIFS	0.42	0.00*	0.00*
HICL	0.69	0.00*	0.00*	TPK	0.38	0.7	0.00*
HIK	0.71	0.00*	0.00*	TRIG	0.2	0.00*	0.00*
HILS	0.24	0.00*	0.00*	TRN	0.1	0.00*	0.00*
HL.	0.53	0.00*	0.00*	TRY	0.22	0.00*	0.00*
HLMA	0.42	0.00*	0.00*	TSCO	0.36	0.00*	0.00*
HOC	0.4	0.00*	0.00*	TUI	0.59	0.00*	0.00*
HRI	0.49	0.00*	0.00*	TW.	0.94	0.00*	0.00*
HSBA	0.32	0.00*	0.00*	UDG	0.73	0.00*	0.00*
HSL	0.59	0.00*	0.00*	UKCM	0.2	0.00*	0.00*
HSTG	0.32	0.00*	0.00*	UKW	0.51	0.00*	0.00*
HSV	0.4	0.61	0.00*	ULE	0.37	0.00*	0.00*
HSX	0.45	0.00*	0.00*	ULVR	0.66	0.00*	0.00*
HTWS	0.54	0.00*	0.00*	USA	0.87	0.00*	0.00*
HVPE	0.7	0.00*	0.00*	UTG	0.43	0.00*	0.00*
HWDN	0.63	0.00*	0.00*	UU.	0.39	0.00*	0.00*

IAG	0.87	0.00*	0.00*	VCT	0.09	0.00*	0.00*
IBST	0.92	0.00*	0.00*	VEC	0.13	0.00*	0.00*
ICGT	0.65	0.00*	0.00*	VEIL	0.69	0.47	0.00*
ICP	0.68	0.00*	0.00*	VMUK	0.89	0.00*	0.00*
IEM	0.01*	0.00*	0.00*	VOD	0.41	0.00*	0.00*
IGG	0.72	0.00*	0.00*	VOF	0.23	0.00*	0.00*
IHG	0.48	0.00*	0.00*	VSVS	0.66	0.00*	0.33
IHP	0.82	0.00*	0.00*	VTY	0.01*	0.00*	0.00*
III	0.85	0.00*	0.00*	VVO	0.06	0.00*	0.00*
IMB	0.2	0.00*	0.00*	WEIR	0.13	0.00*	0.00*
IMI	0.85	0.00*	0.00*	WG.	0.06	0.35	0.00*
INCH	0.01*	0.00*	0.00*	WIZZ	0.13	0.00*	0.00*
INDV	0.75	0.00*	0.00*	WKP	0.66	0.00*	0.00*
INF	0.6	0.00*	0.00*	WMH	0.31	0.00*	0.00*
INPP	0.71	0.00*	0.00*	WOSG	0.25	0.00*	0.00*
INVP	0.72	0.00*	0.22	WPP	0.22	0.00*	0.00*
IPO	0.83	0.00*	0.00*	WTAN	0.97	0.00*	0.00*
ITRK	0.44	0.00*	0.00*	WTB	0.01*	0.00*	0.00*
ITV	0.35	0.00*	0.00*	WWH	0.5	0.00*	0.00*
IWG	0.06	0.00*	0.00*	XPP	0.12	0.00*	0.00*

Table A-7 LRT Results (p-value for t-statistics) for Gold, T-bills, and SOFR in the US

Code	Gold	T-bills	SOFR	Code	Gold	T-bills	SOFR
ATVI	0.66	0.00*	0.00*	MTD	0.06	0.00*	0.00*
GOOGL	0.35	0.00*	0.71	MYL	0.96	0.00*	0.00*
GOOG	0.77	0.36	0.00*	PKI	0.72	0.00*	0.00*
T	0.65	0.00*	0.00*	PRGO	0.04*	0.00*	0.3
CTL	0.01*	0.00*	0.00*	PFE	0.8	0.00*	0.00*
CHTR	0.1	0.00*	0.00*	DGX	0.00*	0.00*	0.21
CMCSA	0.21	0.59	0.12	REGN	0.01*	0.00*	0.00*
DISCA	0.02*	0.00*	0.00*	RMD	0.55	0.00*	0.00*
DISCK	0.99	0.00*	0.00*	STE	0.97	0.00*	0.00*
DISH	0.14	0.00*	0.00*	SYK	0.34	0.00*	0.00*
EA	0.98	0.00*	0.00*	TFX	0.47	0.00*	0.00*
FB	0.1	0.33	0.32	COO	0.00*	0.00*	0.11
FOXA	0.39	0.00*	0.00*	TMO	0.15	0.00*	0.00*
FOX	0.91	0.00*	0.00*	UNH	0.4	0.00*	0.00*
IPG	0.14	0.00*	0.00*	UHS	0.21	0.00*	0.00*
LYV	0.69	0.00*	0.65	VAR	0.58	0.00*	0.00*
NFLX	0.39	0.00*	0.00*	VRTX	0.55	0.00*	0.00*
NWSA	0.13	0.4	0.00*	WAT	0.85	0.00*	0.00*
NWS	0.57	0.00*	0.00*	WST	0.09	0.00*	0.00*
OMC	0.18	0.00*	0.00*	ZBH	0.99	0.00*	0.00*
TMUS	0.69	0.00*	0.00*	ZTS	0.00*	0.00*	0.12
TTWO	0.91	0.00*	0.00*	MMM	0.17	0.00*	0.00*
DIS	0.76	0.85	0.00*	AOS	0.3	0.00*	0.00*
TWTR	0.01*	0.00*	0.00*	ALK	0.25	0.00*	0.00*
VZ	0.21	0.00*	0.36	ALLE	0.34	0.00*	0.00*
VIAC	0.97	0.00*	0.00*	AAL	0.33	0.00*	0.00*
AAP	0.28	0.00*	0.00*	AME	0.1	0.00*	0.00*
AMZN	0.68	0.00*	0.00*	BA	0.77	0.00*	0.00*

APTV	0.00*	0.00*	0.00*	CHRW	0.73	0.00*	0.00*
AZO	0.11	0.00*	0.00*	CARR	0.45	0.00*	0.00*
BBY	0.8	0.35	0.00*	CAT	0.9	0.33	0.88
BKNG	0.54	0.00*	0.00*	CTAS	0.47	0.00*	0.00*
BWA	0.46	0.00*	0.00*	CPRT	0.66	0.00*	0.00*
KMX	0.55	0.00*	0.63	CSX	0.64	0.00*	0.00*
CCL	0.38	0.00*	0.00*	CMI	0.00*	0.00*	0.00*
CMG	0.94	0.00*	0.00*	DE	0.32	0.00*	0.00*
DHI	0.46	0.00*	0.00*	DAL	0.03*	0.00*	0.00*
DRI	0.19	0.00*	0.00*	DOV	0.5	0.00*	0.00*
DG	0.00*	0.81	0.00*	ETN	0.62	0.00*	0.97
DLTR	0.84	0.00*	0.17	EMR	0.5	0.00*	0.00*
DPZ	0.28	0.00*	0.00*	EFX	0.52	0.00*	0.00*
EBAY	0.71	0.00*	0.00*	EXPD	0.54	0.00*	0.00*
EXPE	0.93	0.06	0.00*	FAST	0.92	0.00*	0.00*
F	0.53	0.00*	0.00*	FDX	0.12	0.00*	0.00*
GPS	0.67	0.00*	0.00*	FLS	0.3	0.00*	0.00*
GRMN	0.81	0.00*	0.00*	FTV	0.01*	0.34	0.00*
GM	0.81	0.28	0.00*	FBHS	0.37	0.00*	0.00*
GPC	0.27	0.00*	0.00*	GD	0.21	0.00*	0.00*
HRB	0.26	0.00*	0.00*	GE	0.79	0.00*	0.00*
HBI	0.00*	0.00*	0.00*	GWV	0.4	0.00*	0.00*
HAS	0.11	0.00*	0.00*	HON	0.00*	0.00*	0.00*
HLT	0.23	0.00*	0.00*	HWM	0.96	0.00*	0.00*
HD	0.71	0.00*	0.00*	HII	0.06	0.00*	0.00*
KSS	0.24	0.00*	0.00*	IEX	0.61	0.00*	0.00*
LB	0.43	0.08	0.31	INFO	0.32	0.00*	0.00*
LVS	0.78	0.00*	0.00*	ITW	0.81	0.00*	0.00*
LEG	0.85	0.00*	0.00*	IR	0.91	0.00*	0.86
LEN	0.97	0.00*	0.00*	JBHT	0.4	0.00*	0.00*
LKQ	0.54	0.00*	0.00*	J	0.77	0.00*	0.00*
LOW	0.15	0.00*	0.00*	JCI	0.66	0.00*	0.00*

MAR	0.38	0.00*	0.00*	KSU	0.02*	0.57	0.00*
MCD	0.45	0.00*	0.00*	LHX	0.87	0.00*	0.00*
MGM	0.25	0.00*	0.00*	LMT	0.97	0.00*	0.00*
MHK	0.51	0.00*	0.00*	MAS	0.06	0.00*	0.00*
NWL	0.35	0.00*	0.00*	NLSN	0.95	0.00*	0.00*
NKE	0.01*	0.00*	0.00*	NSC	0.14	0.00*	0.00*
NCLH	0.41	0.89	0.93	NOC	0.00*	0.00*	0.00*
NVR	0.66	0.00*	0.00*	ODFL	0.89	0.00*	0.00*
ORLY	0.1	0.00*	0.00*	OTIS	0.97	0.00*	0.00*
PHM	0.9	0.00*	0.00*	PCAR	0.01*	0.00*	0.00*
PVH	0.38	0.00*	0.00*	PH	0.59	0.00*	0.00*
RL	0.58	0.00*	0.00*	PNR	0.00*	0.00*	0.37
ROST	0.00*	0.00*	0.43	PWR	0.31	0.00*	0.00*
RCL	0.9	0.00*	0.00*	RTX	0.5	0.00*	0.00*
SBUX	0.62	0.00*	0.00*	RSG	0.39	0.00*	0.87
TPR	0.85	0.79	0.76	RHI	0.83	0.86	0.00*
TGT	0.43	0.00*	0.00*	ROK	0.71	0.00*	0.00*
TIF	0.91	0.00*	0.00*	ROL	0.18	0.00*	0.00*
TJX	0.31	0.00*	0.00*	ROP	0.54	0.00*	0.00*
TSCO	0.61	0.00*	0.00*	SNA	0.76	0.00*	0.00*
ULTA	0.45	0.00*	0.00*	LUV	0.24	0.00*	0.00*
UAA	0.75	0.00*	0.79	SWK	0.87	0.00*	0.00*
UA	0.56	0.00*	0.00*	TDY	0.76	0.00*	0.00*
VFC	0.87	0.00*	0.00*	TXT	0.95	0.00*	0.00*
WHR	0.44	0.7	0.00*	TT	0.35	0.00*	0.00*
WYNN	0.19	0.00*	0.00*	TDG	0.09	0.00*	0.00*
YUM	0.14	0.00*	0.00*	UNP	0.38	0.00*	0.00*
MO	0.9	0.00*	0.00*	UAL	0.24	0.00*	0.18
ADM	0.25	0.00*	0.00*	UPS	0.63	0.00*	0.00*
BF.B	0.01*	0.00*	0.37	URI	0.54	0.00*	0.00*
CPB	0.25	0.00*	0.00*	VRSK	0.69	0.93	0.00*
CHD	0.97	0.00*	0.00*	WAB	0.01*	0.00*	0.00*

KO	0.17	0.00*	0.00*	WM	0.39	0.00*	0.61
CL	0.76	0.34	0.00*	XYL	0.53	0.00*	0.00*
CAG	0.86	0.00*	0.00*	ACN	0.93	0.00*	0.00*
STZ	0.95	0.00*	0.00*	ADBE	0.00*	0.00*	0.00*
COST	0.23	0.00*	0.07	AMD	0.21	0.00*	0.00*
COTY	0.28	0.00*	0.00*	AKAM	0.55	0.00*	0.00*
EL	0.31	0.00*	0.00*	APH	0.35	0.00*	0.00*
GIS	0.95	0.58	0.00*	ADI	0.17	0.00*	0.00*
HRL	0.73	0.00*	0.00*	ANSS	0.00*	0.00*	0.09
SJM	0.28	0.00*	0.00*	AAPL	0.4	0.00*	0.00*
K	0.6	0.00*	0.00*	AMAT	0.73	0.00*	0.00*
KMB	0.76	0.00*	0.00*	ANET	0.36	0.00*	0.48
KHC	0.12	0.00*	0.00*	ADSK	0.82	0.00*	0.00*
KR	0.49	0.36	0.47	ADP	0.93	0.47	0.00*
LW	0.14	0.00*	0.00*	AVGO	0.72	0.00*	0.00*
MKC	0.08	0.00*	0.00*	BR	0.76	0.00*	0.34
TAP	0.89	0.00*	0.00*	CDNS	0.67	0.00*	0.00*
MDLZ	0.66	0.00*	0.00*	CDW	0.27	0.00*	0.00*
MNST	0.00*	0.00*	0.00*	CSCO	0.81	0.00*	0.00*
PEP	0.56	0.00*	0.00*	CTXS	0.65	0.00*	0.00*
PM	0.81	0.00*	0.00*	CTSH	0.43	0.00*	0.00*
PG	0.22	0.00*	0.00*	GLW	0.2	0.00*	0.00*
SYY	0.81	0.49	0.72	DXC	0.38	0.00*	0.00*
CLX	0.21	0.00*	0.00*	FFIV	0.52	0.00*	0.00*
HSY	0.66	0.00*	0.00*	FIS	0.91	0.00*	0.00*
TSN	0.34	0.00*	0.00*	FISV	0.09	0.00*	0.00*
WBA	0.65	0.00*	0.00*	FLT	0.00*	0.00*	0.51
WMT	0.81	0.00*	0.00*	FLIR	0.42	0.00*	0.00*
APA	0.48	0.5	0.00*	FTNT	0.98	0.00*	0.00*
BKR	0.53	0.00*	0.00*	IT	0.32	0.00*	0.00*
COG	0.89	0.00*	0.00*	GPN	0.19	0.00*	0.00*
CVX	0.53	0.00*	0.00*	HPE	0.46	0.46	0.00*

CXO	0.00*	0.00*	0.00*	HPQ	0.2	0.00*	0.23
COP	0.74	0.26	0.00*	INTC	0.65	0.00*	0.00*
DVN	0.48	0.00*	0.00*	IBM	0.46	0.00*	0.00*
FANG	0.1	0.00*	0.00*	INTU	0.36	0.00*	0.00*
EOG	0.59	0.00*	0.00*	IPGP	0.93	0.00*	0.00*
XOM	0.09	0.00*	0.00*	JKHY	0.95	0.00*	0.00*
HAL	0.67	0.00*	0.00*	JNPR	0.00*	0.00*	0.00*
HES	0.01*	0.00*	0.00*	KEYS	0.75	0.00*	0.00*
HFC	0.66	0.97	0.00*	KLAC	0.96	0.00*	0.00*
KMI	0.37	0.00*	0.00*	LRCX	0.37	0.00*	0.00*
MRO	0.17	0.00*	0.00*	LDOS	0.37	0.00*	0.00*
MPC	0.51	0.00*	0.98	MA	0.00*	0.74	0.00*
NOV	0.52	0.00*	0.00*	MXIM	0.14	0.00*	0.7
NBL	0.78	0.00*	0.00*	MCHP	0.21	0.00*	0.00*
OXY	0.69	0.54	0.00*	MU	0.65	0.00*	0.00*
OKE	0.37	0.00*	0.00*	MSFT	0.66	0.00*	0.00*
PSX	0.00*	0.00*	0.00*	MSI	0.85	0.00*	0.00*
PXD	0.82	0.00*	0.00*	NTAP	0.79	0.00*	0.00*
SLB	0.58	0.00*	0.00*	NLOK	0.43	0.00*	0.00*
FTI	0.23	0.00*	0.00*	NVDA	0.17	0.00*	0.00*
VLO	0.55	0.00*	0.00*	ORCL	0.4	0.00*	0.00*
WMB	0.74	0.00*	0.00*	PAYX	0.64	0.00*	0.00*
AFL	0.8	0.00*	0.00*	PAYC	0.08	0.00*	0.00*
ALL	0.12	0.00*	0.00*	PYPL	0.00*	0.94	0.00*
AXP	0.91	0.00*	0.00*	QRVO	0.67	0.00*	0.56
AIG	0.1	0.00*	0.00*	QCOM	0.54	0.00*	0.00*
AMP	0.93	0.00*	0.28	CRM	0.16	0.00*	0.00*
AON	0.69	0.00*	0.00*	STX	0.73	0.00*	0.82
AJG	0.00*	0.00*	0.00*	NOW	0.84	0.00*	0.00*
AIZ	0.66	0.72	0.00*	SWKS	0.82	0.00*	0.00*
BAC	0.53	0.00*	0.00*	SNPS	0.00*	0.00*	0.00*
BRK.B	0.12	0.00*	0.00*	TEL	0.42	0.00*	0.00*

BLK	0.88	0.00*	0.24	TXN	0.46	0.00*	0.00*
COF	0.52	0.00*	0.00*	TYL	0.3	0.00*	0.00*
CBOE	0.82	0.00*	0.00*	VRSN	0.17	0.00*	0.00*
SCHW	0.26	0.00*	0.00*	V	0.42	0.00*	0.00*
CB	0.69	0.00*	0.00*	WDC	0.11	0.00*	0.00*
CINF	0.51	0.00*	0.00*	WU	0.92	0.00*	0.00*
C	0.12	0.00*	0.00*	XRX	0.00*	0.97	0.00*
CFG	0.79	0.00*	0.00*	XLNX	0.23	0.00*	0.00*
CME	0.92	0.00*	0.00*	ZBRA	0.79	0.00*	0.00*
CMA	0.74	0.00*	0.38	APD	0.65	0.00*	0.00*
DFS	0.00*	0.00*	0.00*	ALB	0.04*	0.00*	0.00*
ETFC	0.74	0.00*	0.00*	AMCR	0.89	0.00*	0.00*
RE	0.8	0.00*	0.00*	AVY	0.18	0.00*	0.00*
FITB	0.91	0.00*	0.00*	BLL	0.74	0.00*	0.19
FRC	0.24	0.00*	0.00*	CE	0.06	0.00*	0.00*
BEN	0.57	0.19	0.82	CF	0.08	0.00*	0.00*
GL	0.94	0.00*	0.00*	CTVA	0.00*	0.00*	0.00*
GS	0.38	0.00*	0.00*	DOW	0.58	0.00*	0.00*
HIG	0.67	0.00*	0.00*	DD	0.9	0.51	0.62
HBAN	0.13	0.00*	0.00*	EMN	0.71	0.00*	0.00*
ICE	0.92	0.00*	0.00*	ECL	0.24	0.00*	0.00*
IVZ	0.41	0.00*	0.19	FMC	0.86	0.00*	0.00*
JPM	0.5	0.00*	0.00*	FCX	0.00*	0.00*	0.00*
KEY	0.79	0.00*	0.00*	IFF	0.33	0.00*	0.00*
LNC	0.00*	0.00*	0.00*	IP	0.39	0.00*	0.00*
L	0.62	0.00*	0.00*	LIN	0.01*	0.00*	0.00*
MTB	0.28	0.00*	0.51	LYB	0.18	0.00*	0.00*
MKTX	0.11	0.00*	0.00*	MLM	0.11	0.00*	0.00*
MMC	0.01*	0.00*	0.00*	NEM	0.24	0.00*	0.41
MET	0.62	0.00*	0.00*	NUE	0.46	0.00*	0.00*
MCO	0.16	0.00*	0.00*	PKG	0.00*	0.00*	0.00*
MS	0.63	0.00*	0.00*	PPG	0.69	0.00*	0.00*

MSCI	0.58	0.00*	0.00*	SEE	0.64	0.00*	0.00*
NDAQ	0.56	0.00*	0.42	SHW	0.66	0.00*	0.00*
NTRS	0.76	0.00*	0.00*	MOS	0.81	0.00*	0.00*
PBCT	0.2	0.00*	0.00*	VMC	0.54	0.00*	0.00*
PNC	0.00*	0.00*	0.00*	WRK	0.6	0.00*	0.00*
PFG	0.08	0.00*	0.00*	ARE	0.00*	0.00*	0.00*
PGR	0.89	0.00*	0.00*	AMT	0.85	0.00*	0.00*
PRU	0.99	0.00*	0.00*	AIV	0.00*	0.00*	0.00*
RJF	0.63	0.00*	0.00*	AVB	0.23	0.00*	0.00*
RF	0.73	0.00*	0.00*	BXP	0.35	0.00*	0.00*
SPGI	0.00*	0.00*	0.00*	CBRE	0.9	0.00*	0.00*
STT	0.39	0.00*	0.00*	CCI	0.00*	0.00*	0.00*
SIVB	0.56	0.00*	0.00*	DLR	0.88	0.00*	0.00*
SYF	0.43	0.00*	0.00*	DRE	0.37	0.00*	0.00*
TROW	0.25	0.00*	0.00*	EQIX	0.78	0.00*	0.24
BK	0.24	0.00*	0.00*	EQR	0.09	0.00*	0.00*
TRV	0.29	0.00*	0.00*	ESS	0.89	0.00*	0.00*
TFC	0.61	0.00*	0.00*	EXR	0.00*	0.00*	0.00*
USB	0.24	0.00*	0.00*	FRT	0.95	0.00*	0.00*
UNM	0.22	0.00*	0.44	PEAK	0.99	0.00*	0.00*
WRB	0.55	0.00*	0.00*	HST	0.85	0.00*	0.00*
WFC	0.3	0.00*	0.00*	IRM	0.00*	0.00*	0.00*
WLTW	0.00*	0.00*	0.00*	KIM	0.21	0.00*	0.00*
ZION	0.49	0.00*	0.00*	MAA	0.46	0.00*	0.00*
ABT	0.86	0.00*	0.00*	PLD	0.42	0.00*	0.00*
ABBV	0.99	0.00*	0.00*	PSA	0.79	0.00*	0.00*
ABMD	0.27	0.00*	0.00*	O	0.46	0.00*	0.00*
A	0.49	0.00*	0.00*	REG	0.46	0.00*	0.00*
ALXN	0.87	0.00*	0.00*	SBAC	0.00*	0.00*	0.00*
ALGN	0.13	0.00*	0.00*	SPG	0.09	0.00*	0.00*
ABC	0.00*	0.00*	0.00*	SLG	0.27	0.00*	0.00*
AMGN	0.27	0.00*	0.00*	UDR	0.46	0.00*	0.00*

ANTM	0.01*	0.29	0.00*	VTR	0.62	0.00*	0.88
BAX	0.11	0.00*	0.00*	VNO	0.13	0.00*	0.00*
BDX	0.46	0.00*	0.84	WELL	0.00*	0.64	0.00*
BIO	0.07	0.00*	0.00*	WY	0.59	0.00*	0.00*
BIIB	0.00*	0.00*	0.00*	Symbol	0.00*	0.00*	0.00*
BSX	0.09	0.00*	0.00*	AES	0.49	0.00*	0.00*
BMY	0.08	0.00*	0.00*	LNT	0.29	0.00*	0.00*
CAH	0.99	0.00*	0.00*	AEE	0.01*	0.00*	0.00*
CNC	0.54	0.00*	0.00*	AEP	0.28	0.00*	0.00*
CERN	0.52	0.00*	0.00*	AWK	0.11	0.36	0.00*
CI	0.54	0.00*	0.00*	ATO	0.99	0.00*	0.00*
CVS	0.00*	0.00*	0.00*	CNP	0.00*	0.00*	0.00*
DHR	0.67	0.00*	0.00*	CMS	0.5	0.00*	0.00*
DVA	0.88	0.00*	0.00*	ED	0.4	0.00*	0.00*
XRAY	0.01*	0.00*	0.41	D	0.89	0.00*	0.00*
DXCM	0.89	0.00*	0.00*	DTE	0.07	0.00*	0.00*
EW	0.17	0.00*	0.00*	DUK	0.07	0.00*	0.00*
GILD	0.47	0.00*	0.00*	EIX	0.07	0.00*	0.00*
HCA	0.19	0.00*	0.00*	ETR	0.83	0.00*	0.07
HSIC	0.00*	0.00*	0.00*	EVRG	0.00*	0.00*	0.00*
HOLX	0.54	0.00*	0.00*	ES	0.74	0.00*	0.00*
HUM	0.57	0.00*	0.00*	EXC	0.95	0.00*	0.00*
IDXX	0.81	0.00*	0.00*	FE	0.07	0.00*	0.00*
ILMN	0.00*	0.00*	0.00*	NEE	0.00*	0.00*	0.00*
INCY	0.82	0.00*	0.00*	NI	0.06	0.61	0.00*
ISRG	0.11	0.11	0.00*	NRG	0.72	0.00*	0.00*
IQV	0.97	0.00*	0.00*	PNW	0.81	0.00*	0.00*
JNJ	0.56	0.00*	0.00*	PPL	0.01*	0.00*	0.00*
LH	0.52	0.00*	0.00*	PEG	0.99	0.00*	0.00*
LLY	0.00*	0.00*	0.62	SRE	0.00*	0.24	0.00*
MCK	0.94	0.8	0.00*	SO	0.56	0.00*	0.83
MDT	0.22	0.00*	0.00*	WEC	0.00*	0.00*	0.00*

MRK	0.26	0.00*	0.00*	XEL	0.24	0.00*	0.00*
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Table A-8 LRT Results (p-value for t-statistics) for Gold, T-bills, and IBOR in China

Code	Gold	T-bills	IBOR	Code	Gold	T-bills	IBOR
600000	0.44	0.00*	0.14	600895	0.11	0.00*	0.98
600004	0.17	0.00*	0.38	600900	0.56	0.00*	0.81
600009	0.25	0.00*	0.23	600909	0.2	0.00*	0.87
600010	0.45	0.88	0.93	600919	0.08	0.00*	0.27
600011	0.99	0.00*	0.17	600926	0.94	0.00*	0.3
600015	0.87	0.00*	0.11	600928	0.56	0.00*	0.34
600016	0.24	0.00*	0.59	600958	0.68	0.00*	0.08
600018	0.63	0.00*	0.01*	600968	0.5	0.00*	0.97
600019	0.41	0.00*	0.56	600977	0.7	0.00*	0.01*
600025	0.44	0.00*	0.3	600989	0.17	0.00*	0.54
600028	0.73	0.98	0.18	600999	0.96	0.00*	0.07
600029	0.11	0.00*	0.93	601006	0.53	0.00*	0.23
600030	0.62	0.00*	0.59	601009	0.55	0.62	0.45
600031	0.97	0.00*	0.59	601012	0.81	0.00*	0.69
600036	0.5	0.53	0.89	601021	0.12	0.00*	0.85
600038	0.2	0.00*	0.09	601066	0.98	0.00*	0.56
600048	0.4	0.00*	0.13	601077	0.07	0.00*	0.55
600050	0.11	0.00*	0.92	601088	0.68	0.00*	0.07
600061	0.36	0.74	0.19	601099	0.63	0.00*	0.78
600066	0.68	0.00*	0.95	601100	0.19	0.00*	0.31
600068	0.32	0.00*	0.82	601108	0.52	0.00*	0.65
600085	0.53	0.00*	0.92	601111	0.34	0.00*	0.66
600089	0.96	0.00*	0.81	601138	0.61	0.00*	0.48
600104	0.29	0.00*	0.39	601155	0.99	0.00*	0.09
600109	0.31	0.00*	0.02*	601162	0.86	0.00*	0.97
600111	0.28	0.00*	0.84	601166	0.07	0.00*	0.39
600115	0.67	0.00*	0.96	601169	0.91	0.00*	0.04*
600118	0.01*	0.00*	0.21	601186	0.15	0.53	0.34
600150	0.6	0.00*	0.58	601198	0.12	0.00*	0.78
600155	0.49	0.00*	0.06	601211	0.18	0.00*	0.4

600176	0.21	0.00*	0.59	601225	0.55	0.00*	0.32
600177	0.73	0.00*	0.97	601229	0.52	0.00*	0.41
600183	0.5	0.00*	0.22	601233	0.14	0.00*	0.28
600196	0.23	0.00*	0.31	601236	0.64	0.00*	0.89
600201	0.75	0.00*	0.89	601238	0.33	0.43	0.68
600208	0.32	0.00*	0.15	601288	0.25	0.00*	0.76
600271	0.96	0.45	0.56	601318	0.7	0.00*	0.93
600276	0.98	0.00*	0.74	601319	0.02*	0.00*	0.47
600298	0.07	0.00*	0.81	601328	0.58	0.00*	0.9
600309	0.24	0.00*	0.1	601336	0.43	0.00*	0.96
600332	0.42	0.00*	0.77	601377	0.67	0.00*	0.3
600340	0.38	0.00*	0.79	601390	0.09	0.00*	0.82
600346	0.06	0.00*	0.5	601398	0.59	0.00*	0.27
600352	0.2	0.00*	0.5	601519	0.69	0.00*	0.12
600362	0.95	0.00*	0.77	601555	0.34	0.00*	0.3
600383	0.55	0.00*	0.78	601601	0.4	0.00*	0.85
600406	0.89	0.00*	0.51	601607	0.77	0.00*	0.74
600436	0.54	0.00*	0.64	601618	0.18	0.00*	0.83
600438	0.28	0.85	0.99	601628	0.09	0.00*	0.06
600487	0.85	0.00*	0.37	601633	0.91	0.94	0.75
600489	0.37	0.00*	0.93	601658	0.33	0.00*	0.88
600516	0.58	0.00*	0.63	601668	0.46	0.00*	0.71
600519	0.79	0.00*	0.51	601669	0.31	0.00*	0.95
600521	0.09	0.00*	0.87	601688	0.62	0.00*	0.28
600522	0.57	0.00*	0.63	601698	0.28	0.00*	0.57
600536	0.77	0.00*	0.33	601766	0.69	0.00*	0.36
600547	0.82	0.00*	0.24	601788	0.74	0.00*	0.53
600570	0.36	0.00*	0.27	601800	0.13	0.00*	0.52
600572	0.58	0.00*	0.52	601816	0.44	0.00*	0.25
600585	0.56	0.00*	0.96	601818	0.41	0.00*	0.15
600588	0.78	0.00*	0.23	601857	0.25	0.00*	0.14
600598	0.09	0.00*	0.7	601860	0.64	0.00*	0.01*

600600	0.92	0.00*	0.09	601872	0.07	0.00*	0.54
600604	0.74	0.99	0.33	601877	0.91	0.00*	0.53
600606	0.14	0.00*	0.35	601878	0.94	0.00*	0.99
600621	0.54	0.00*	0.04*	601881	0.4	0.00*	0.1
600637	0.99	0.00*	0.59	601888	0.47	0.00*	0.84
600660	0.55	0.00*	0.93	601899	0.91	0.95	0.75
600690	0.97	0.00*	0.44	601901	0.22	0.00*	0.18
600699	0.16	0.00*	0.86	601916	0.17	0.00*	0.56
600703	0.68	0.00*	0.19	601933	0.66	0.00*	0.11
600705	0.68	0.00*	0.34	601939	0.79	0.00*	0.89
600733	0.16	0.00*	0.83	601985	0.04*	0.00*	0.62
600737	0.71	0.00*	0.8	601988	0.43	0.00*	0.23
600741	0.42	0.00*	0.46	601989	0.57	0.00*	0.88
600745	0.46	0.35	0.7	601990	0.92	0.00*	0.32
600760	0.01*	0.00*	0.19	601998	0.12	0.00*	0.81
600763	0.15	0.00*	0.34	603019	0.44	0.00*	0.63
600779	0.84	0.00*	0.75	603160	0.63	0.00*	0.1
600795	0.24	0.00*	0.74	603259	0.06	0.00*	0.49
600801	0.5	0.00*	0.62	603288	0.82	0.00*	0.01*
600809	0.53	0.00*	0.96	603369	0.17	0.00*	0.53
600837	0.12	0.00*	0.19	603501	0.82	0.57	0.31
600848	0.53	0.00*	0.13	603517	0.31	0.99	0.65
600867	0.58	0.00*	0.96	603589	0.9	0.00*	0.53
600872	0.96	0.00*	0.37	603799	0.09	0.00*	0.99
600875	0.97	0.00*	0.61	603833	0.45	0.00*	0.53
600886	0.98	0.32	0.9	603983	0.59	0.00*	0.92
600887	0.63	0.00*	0.51	603986	0.78	0.00*	0.41
600893	0.7	0.00*	0.66	603993	0.65	0.76	0.61

Table A-9 LRT Results (p-value for t-statistics) for Gold, T-bills, and TONA in Japan

Code	Gold	T-bills	TONA	Code	Gold	T-bills	TONA
4503	0.45	0.46	0.00*	1605	0.1	0.58	0.00*
4519	0.66	0.61	0.00*	3401	0.2	0.54	0.00*
4568	0.61	0.02*	0.88	3402	0.9	0.18	0.46
4506	0.56	0.79	0.00*	3101	0.02*	0.19	0.00*
4523	0.66	0.12	0.00*	3103	0.8	0.36	0.00*
4151	0.01*	0.13	0.00*	3863	0.12	0.67	0.00*
4578	0.3	0.68	0.00*	3861	0.14	0.02*	0.00*
4507	0.54	0.17	0.68	3407	0.71	0.47	0.00*
4502	0.15	0.82	0.00*	4061	0.37	0.82	0.00*
6857	0.09	0.88	0.00*	4631	0.5	0.54	0.82
6770	0.14	0.67	0.00*	4901	0.04*	0.11	0.00*
7751	0.1	0.79	0.89	4452	0.42	0.95	0.00*
6952	0.55	0.41	0.00*	3405	0.78	0.14	0.00*
7735	0.85	0.02*	0.00*	4188	0.69	0.98	0.00*
6902	0.63	0.89	0.00*	4183	0.35	0.88	0.00*
6954	0.59	0.68	0.71	4021	0.87	0.31	0.69
6504	0.94	0.58	0.00*	6988	0.87	0.44	0.00*
6702	0.81	0.29	0.00*	4063	0.11	0.88	0.00*
6674	0.83	0.53	0.00*	4911	0.01*	0.45	0.00*
6501	0.61	0.58	0.00*	4004	0.9	0.54	0.00*
6971	0.83	0.66	0.00*	4005	0.48	0.74	0.00*
6479	0.02*	0.88	0.7	4043	0.93	0.02*	0.00*
6503	0.86	0.95	0.00*	4042	0.18	0.23	0.64
6701	0.29	0.22	0.00*	4208	0.78	0.84	0.00*
3105	0.34	0.67	0.00*	5020	0.94	0.64	0.00*
6703	0.48	0.56	0.00*	5019	0.18	0.14	0.00*
6645	0.66	0.75	0.00*	5108	0.08	0.04*	0.00*
6752	0.87	0.89	0.88	5101	0.56	0.17	0.00*
7752	0.95	0.49	0.00*	5201	0.53	0.47	0.00*

6724	0.52	0.51	0.00*	5333	0.13	0.65	0.00*
6758	0.01*	0.19	0.00*	5214	0.79	0.63	0.00*
6976	0.74	0.77	0.00*	5202	0.56	0.28	0.00*
6762	0.67	0.47	0.00*	5232	0.97	0.93	0.00*
8035	0.64	0.99	0.00*	5233	0.82	0.61	0.00*
6506	0.19	0.5	0.00*	5301	0.67	0.35	0.00*
6841	0.47	0.49	0.00*	5332	0.52	0.56	0.00*
7205	0.83	0.89	0.37	5411	0.81	0.3	0.00*
7267	0.68	0.37	0.00*	5406	0.01*	0.98	0.00*
7202	0.23	0.91	0.00*	5401	0.76	0.72	0.00*
7261	0.44	0.14	0.00*	5541	0.34	0.28	0.00*
7211	0.79	0.48	0.00*	5714	0.17	0.02*	0.86
7201	0.48	0.5	0.00*	5803	0.93	0.65	0.00*
7270	0.68	0.72	0.71	5801	0.59	0.12	0.00*
7269	0.12	0.72	0.00*	5711	0.86	0.2	0.00*
7203	0.97	0.04*	0.00*	5706	0.51	0.89	0.00*
7272	0.91	0.33	0.00*	5703	0.95	0.11	0.00*
7762	0.1	0.67	0.00*	3436	0.1	0.42	0.00*
4902	0.56	0.06	0.00*	5802	0.00*	0.65	0.00*
7731	0.01*	0.71	0.00*	5713	0.42	0.62	0.00*
7733	0.81	0.47	0.00*	5707	0.84	0.93	0.00*
4543	0.83	0.13	0.00*	5901	0.81	0.88	0.00*
9433	0.01*	0.7	0.18	8001	0.7	0.19	0.00*
9432	0.5	0.12	0.00*	8002	0.95	0.31	0.00*
9613	0.2	0.87	0.00*	8058	0.81	0.12	0.00*
9437	0.02*	0.9	0.00*	8031	0.52	0.77	0.00*
9412	0.32	0.57	0.00*	2768	0.63	0.28	0.00*
9434	0.67	0.77	0.00*	8053	0.02*	0.73	0.00*
9984	0.91	0.2	0.00*	8015	0.54	0.9	0.00*
8304	0.62	0.77	0.00*	1721	0.53	0.38	0.83
8331	0.48	0.33	0.00*	1925	0.82	0.95	0.00*
7186	0.61	0.8	0.00*	1808	0.95	0.36	0.00*

8309	0.86	0.46	0.00*	1963	0.81	0.67	0.00*
8354	0.03*	0.84	0.00*	1812	0.26	0.74	0.00*
8306	0.57	0.51	0.42	1802	0.78	0.42	0.00*
8411	0.87	0.1	0.00*	1928	0.4	0.92	0.00*
8308	0.71	0.95	0.00*	1803	0.4	0.76	0.00*
8303	0.81	0.6	0.00*	1801	0.96	0.92	0.00*
8355	0.31	0.82	0.00*	6113	0.02*	0.16	0.00*
8316	0.41	0.46	0.00*	6367	0.59	0.31	0.00*
8253	0.75	0.91	0.00*	6367	0.14	0.85	0.00*
8697	0.52	0.06	0.00*	6305	0.77	0.83	0.00*
8601	0.04*	0.83	0.00*	7004	0.47	0.35	0.00*
8628	0.19	0.92	0.00*	7013	0.64	0.2	0.00*
8604	0.06	0.49	0.00*	5631	0.67	0.68	0.00*
8750	0.83	0.63	0.00*	6473	0.81	0.23	0.00*
8725	0.76	0.63	0.00*	6301	0.52	0.07	0.00*
8630	0.52	0.72	0.00*	6326	0.77	0.25	0.00*
8795	0.24	0.11	0.00*	7011	0.46	0.66	0.64
8766	0.01*	0.21	0.00*	6471	0.45	0.65	0.00*
1332	0.37	0.3	0.00*	6472	0.88	0.76	0.00*
1333	0.64	0.99	0.00*	6103	0.01*	0.83	0.00*
2802	0.89	0.65	0.00*	6302	0.92	0.79	0.00*
2502	0.72	0.13	0.55	7012	0.24	0.3	0.00*
2914	0.95	0.22	0.00*	7003	0.78	0.22	0.00*
2801	0.03*	0.06	0.00*	7832	0.49	0.87	0.00*
2503	0.59	0.29	0.00*	7912	0.64	0.23	0.00*
2269	0.97	0.85	0.00*	7911	0.79	0.59	0.00*
2871	0.85	0.17	0.00*	7951	0.46	0.79	0.00*
2282	0.51	0.25	0.00*	8802	0.43	0.32	0.00*
2002	0.73	0.1	0.00*	8801	0.75	0.72	0.00*
2501	0.39	0.89	0.00*	8830	0.35	0.25	0.00*
2531	0.76	0.95	0.26	8804	0.91	0.83	0.00*
8267	0.14	0.5	0.00*	3289	0.05*	0.99	0.00*

8028	0.19	0.94	0.00*	9022	0.32	0.43	0.00*
9983	0.03*	0.47	0.00*	9020	0.6	0.56	0.00*
3099	0.71	0.17	0.00*	9008	0.3	0.81	0.89
3086	0.44	0.9	0.00*	9009	0.49	0.1	0.00*
8252	0.57	0.32	0.00*	9007	0.53	0.69	0.00*
3382	0.83	0.44	0.00*	9001	0.94	0.64	0.00*
8233	0.73	0.99	0.00*	9005	0.98	0.81	0.00*
4751	0.19	0.79	0.00*	9021	0.69	0.2	0.00*
2432	0.16	0.35	0.00*	9062	0.68	0.73	0.14
4324	0.08	0.38	0.00*	9064	0.43	0.34	0.00*
6178	0.65	0.96	0.83	9107	0.02*	0.56	0.00*
9766	0.08	0.48	0.00*	9104	0.45	0.54	0.00*
2413	0.99	0.35	0.00*	9101	0.42	0.98	0.00*
4755	0.79	0.71	0.00*	9302	0.76	0.66	0.00*
6098	0.95	0.84	0.00*	9301	0.79	0.74	0.00*
9735	0.79	0.65	0.00*	9502	0.68	0.81	0.00*
9602	0.02*	0.42	0.00*	9503	0.29	0.84	0.9
4704	0.88	0.81	0.00*	9501	0.71	0.86	0.00*
4689	0.77	0.31	0.00*	9532	0.67	0.79	0.00*
				9531	0.95	0.97	0.00*

Table A-10 LRT Results (p-value for t-statistics) for Gold, T-bills, and IBOR in India

Code	Gold	T-bills	IBOR
500820	0.01*	0.01*	0.00*
532215	0.31	0.00*	0.00*
532977	0.5	0.00*	0.00*
500034	0.42	0.00*	0.01*
532978	0.24	0.77	0.03*
532454	0.61	0.00*	0.04*
532281	0.85	0.00*	0.00*
500010	0.17	0.00*	0.00*
500180	0.64	0.00*	0.00*
500696	0.42	0.00*	0.00*
532174	0.99	0.00*	0.00*
532187	0.7	0.18	0.00*
500209	0.01*	0.00*	0.00*
500875	0.03*	0.00*	0.00*
500247	0.2	0.00*	0.00*
500510	0.9	0.00*	0.00*
500520	0.59	0.00*	0.02*
532500	0.21	0.25	0.00*
500790	0.02*	0.00*	0.73
532555	0.14	0.00*	0.01*
500312	0.66	0.00*	0.14
532898	0.43	0.00*	0.00*
500325	0.81	0.00*	0.00*
500112	0.07	0.00*	0.00*
524715	0.43	0.00*	0.02*
500470	0.65	0.06	0.00*
532540	0.11	0.00*	0.00*
532755	0.18	0.00*	0.00*

500114	0.59	0.00*	0.00*
532538	0.89	0.00*	0.00*