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China Economic Review

journal homepage: www.elsevier.com/locate/chieco

Stock returns under hyperinflation: Evidence from China 1945–48[☆]



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ARTICLE INFO

JEL classification:

C32
E31
N15

Keywords:

Stock return
Hyperinflation
The Fisher hypothesis

ABSTRACT

This paper presents new evidence for the Fisher hypothesis, which states a positive relationship between nominal stock returns and inflation. We introduce a new data set from the episode of hyperinflation that occurred in China after World War II. To establish the reliability of our estimates we consider different frequencies, and time horizons and econometric models. The results reveal that stocks were a complete hedge against expected inflation and a partial hedge against unexpected inflation. In contrast to the empirical literature on the 'stock return-inflation puzzle', we find that the Fisher hypothesis is applicable to common stocks even with a short-horizon in the Chinese hyperinflation context.

1. Introduction

According to the Fisher hypothesis, the nominal interest rate includes an expected real return component plus an expected rate of inflation. As theorized by classical monetarists, real return is determined by real factors and the inflationary expectation should have little influence on the real rate of return. Transposing this notion to stock markets implies a positive one-to-one relationship between stock returns and expected inflation rates (Fama & Schwert, 1977). In a competitive market, common stocks can thus serve as a hedge against inflation. Intuitively, since stocks are claims on the earnings of real assets, it is reasonable to expect that their returns will not be influenced by inflation rate. The relationship between stock returns and inflation rate has substantial influence on optimal asset allocations, because inflation risk is a primary concern for investors. However, empirical studies commonly yield controversial results, mainly by finding negative relationships between stock returns and inflation rates. That is, the stock market tends to perform poorly during inflationary periods.¹ The negative relationship between stock returns and inflation rates is often termed the stock return-inflation puzzle.

A number of arguments have been put forward for this puzzle. For example, the inflation illusion hypothesis, originated in Modigliani and Cohn (1979), receives renewed attention to explain this puzzle (Brandt & Wang, 2003; Campbell & Vuolteenaho, 2004; Cohen, Polk, & Vuolteenaho, 2005 and Lee, 2010). The proxy hypothesis proposed by Fama (1981) holds that an inverse relationship between real stock returns and inflation is spurious because inflation acts as a proxy for real-activity variables in models that relate stock returns to inflation. The risk premium hypothesis suggested by Tobin (1958) claims that an increase in inflation uncertainty, led by higher inflation, causes the market risk premium to rise, resulting in an increase in the required rate of future

[☆] The author acknowledges research support from the National Social Science Foundation of China (Grant No. 16ZDA133).

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¹ See, for example, Nelson (1976) for earlier contributions on US. Similar international results have been reported, for example, by Du (2006) and Lin (2009).

return on stocks, which in turn, lowers current stock prices. Nevertheless, some more recent evidences tend to support the traditional view of the Fisher hypothesis, especially in a long-horizon perspective. For example, [Rushdi, Kim, and Silvapulle \(2012\)](#) show that stocks are very effective instruments for hedging against expected inflation.² There are also some empirical studies that yield controversial results. For example, [Lin \(2009\)](#) finds evidence of the coexistence of a negative long-run effect and a positive short-run effect of unanticipated inflation on real stock returns. [Oxman \(2012\)](#) demonstrates that the regularity that price inflation and stock returns are negatively related depends on the model specification.

As proxy hypothesis argues, the negative stock return-inflation relationship reflects a negative relationship between inflation and real activities, and a positive relationship between stock returns and real activities. In long-horizon studies, researchers can to a certain extent isolate the effect of inflation on stock returns from the effect of real activities on stock returns. In contrast, it's intractable to do so in a short-horizon perspective. However, the natural experiment given by high-inflation, and hyperinflation in particular, may provide an opportunity to test the stock return-inflation relationship. As [Cagan \(1956, p.25\)](#) describes, "Hyperinflations provide a unique opportunity to study monetary phenomena. The astronomical increases in prices and money dwarf the changes in real income and other real factors...Relations between monetary factors can be studied, therefore, in what almost amounts to complete isolation from the real sector of the economy." [Siegel \(2008, p. 205\)](#) claims that "stocks are also the best financial asset if you fear rapid inflation".

A few empirical tests have been conducted on high-inflation environments. For example, using evidence from the Brazilian Market, [Pimentel and Choudhry \(2014\)](#) find that the fundamental relationship between inflation and stock returns is significant different under high and low inflation conditions. Stock returns do act as a hedge against inflation under high-inflation conditions but fail to do so at lower levels of inflation. [Lee, Tang, and Wong \(2000\)](#) show that nominal stock return and inflation are cointegrated during the German hyperinflation period, but the regression coefficient of nominal stock returns on expected inflation is much > 1 (that is, around 9), conflicting the prediction of the Fisher hypothesis.

This paper examines the relationship between stock returns and inflation with a short-horizon during the episode of Chinese hyperinflation after World War II. Although hyperinflations in economic history have been studied intensively in monetary economics, the Chinese hyperinflation period (1945–1949) has rarely drawn economic historians' attention. The Chinese hyperinflation period, however, was the most explosive hyperinflationary experience over a prolonged four-year period in recorded human history. One key advantage of this hyperinflation over the post-World War I German data for the study is that the data series contain more observations to apply toward econometric tests ([Tallman, Tang, & Wang, 2003](#)). It is no doubt that the scarcity of data has proved a barrier for historical studies on China. Nevertheless, the dearth in the literature is somewhat surprising given the rapid development of the current Chinese stock market. Moreover, due to the continued rapid growth of money supply in China in recent years, Chinese investors have been concerned about the potential increase of inflation, which in turn, potentially reduces financial and monetary stability of the country.

This paper tries to fill this lacuna in the literature by examining the stock market performance during the episode of Chinese hyperinflation. Using weekly and monthly frequency data, we demonstrate that stocks appear to be an excellent hedge against expected inflation, and a partial hedge against unexpected inflation. Hence, the Fisher hypothesis can be applied to common stocks even with a short-horizon during the period of Chinese hyperinflation. Previous reports on the negative relationship between inflation and stock returns may be spurious because the authors have not made a distinction of the impact of inflation on common stock returns, and the potential interactions of real economic variables. In periods when the monetary authority is increasing their inflation expectation for the foreseeable future, research in this topic can be helpful for both policy makers and portfolio managers. This paper also makes another contribution to the literature. We bring new data to the table in the form of weekly and monthly time series data on stock return, inflation rate and the black-market interest rate. In recent years, a literature on modern China's financial market has emerged, but its focus has been exclusively on sovereign and corporate debts ([Goetzmann, Ukhov, & Zhu, 2007; Ho & Li, 2014](#)). Thus, we are in position to make one of—if not—the first assessment of the performance of China's equity market before 1949.

The rest of the article is organized as follows. In [Section 2](#) we describe the methodology. [Section 3](#) presents our data and some preliminary analysis. [Section 4](#) presents our empirical results. [Section 5](#) provides some extension and robustness checks on our results. The last section concludes.

2. Methodology

In the context of stock markets, the Fisher hypothesis postulates that the nominal stock return reflects market expectations about the real stock return and inflation. Formally,

$$r_t^e = \kappa_t^e + \pi_t^e, \quad (1)$$

where r_t is nominal stock return, κ_t is real return, and π_t is inflation rate. $x_t^e = E_{t-1}x_t$, is the appropriate equilibrium expected value of x_t implied by the set of information available at $t-1$. The Fisher hypothesis states that the expected nominal rate of stock return move one-to-one with expected inflation. This is often formulated as ex ante real return being statistically uncorrelated with the expected inflation rate, such that,

² For the long-horizon relationship between stock returns and inflation rates, see [Boudoukh and Richardson \(1993\)](#), [Engsted and Tanggaard \(2002\)](#), and [Siegel \(2008, Cha. 11\)](#). For the test for cointegration between stock price and price indexes, see [Ely and Robinson \(1997\)](#), [Kim and Ryoo \(2011\)](#), [Luintel and Paudyal \(2006\)](#) and [Rapach \(2002\)](#).

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