



Cash-futures basis and the impact of market maturity, informed trading, and expiration effects



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ABSTRACT

Cash-futures basis, a proxy for arbitrage opportunities, is examined, and the impact of informed trading and the changing roles of speculators and arbitrageurs are analyzed in both the non-expiration and near-expiration periods. While we observe that market frictions account to some extent for negative spreads, we also found that volatility and liquidity widen spread magnitude, suggesting that speculation dominates arbitrage in this market. Puzzlingly, we found that informed trading impacts spreads in the opposite manner, depending on whether the contract is near expiration, highlighting the importance of controlling for expiration in basis-spread tests. Finally, we construct a measure to proxy for market maturity and track these interactions throughout the course of the market's maturation.

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1. Introduction

Over the past three decades, an abundance of research has been committed to understanding basis risk as it encapsulates the efficiency and the level of integration of the spot and futures markets which should be linked by no-arbitrage arguments. For example, Mackinlay and Ramaswamy (1988) posit that the arbitrage link between the spot and futures markets implies that the markets should have equal volatility. Arago, Corredor, and Santamaria (2003) found in the equity index market that, as the width of the no-arbitrage band decreases, correlation increases and volatility spillovers between the spot and futures markets increase. Basis spread has also been closely studied. Figlewski (1984) and Howard and D'Antonio (1984) have studied the effect of basis risk on hedging effectiveness.¹ Similarly, Bassett, France, and Srpliska (1991) confirm that nonsynchronous trading explains a small but significant portion of the cash-futures spread that prevailed during the principal days of the 1987 stock market crash. Also, Miller, Muthuswamy, and Whaley (1994) found that negative autocorrelation may arise from infrequent trading. In addition, price discovery implications have been addressed by French (1986), and spread reversion has been presented in Miller et al. (1994), Mackinlay and

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¹ Hedging effectiveness for Taiwan index futures and five other international futures markets has been thoroughly investigated in Lee, Wang, and Chen (2009). Their empirical results confirm that stock index futures are effective direct hedging instruments, regardless of hedging schemes or hedging horizons.

Ramaswamy (1988), and He and Wu (2001). Their findings suggest that while spreads remain non-zero and volatile, arbitrageurs still exist in some markets.

Our study expands this discussion to the emerging market of Taiwan, presenting a market with interesting and testable characteristics and striking market frictions, such as daily price movement limits. Accounting for each of these qualities and using several indicators of the relative importance of arbitrageurs and their ability to enforce spread boundaries, we test whether arbitrage boundaries are maintained. While we found that spreads are generally negatively auto-correlated, arbitrage opportunities continue to exist, despite the fact that cash delivery, negligible convenience yield and costs of carry, and the generally low cost of trading should all act to enforce arbitrage boundaries of index futures. Others have documented similar arbitrage opportunities including Mackinlay and Ramaswamy (1988), Chan, Chan, and Karolyi (1991), Chan (1993), Hasbrouck (1996), Harris, Sofianos, and Shapiro (1994), Kawaller, Koch, and Koch (1993). Specifically in emerging markets, Bailey (1989), Brennan and Schwartz (1988, 1990), and Jarrow (1988), among others, investigate arbitrage opportunities and find that while arbitrageurs may exist, substantial spreads persist as speculative trading outweighs the counteracting trades of arbitrageurs. Indeed, Lin, Lee, and Wang (2013) document market events, e.g. lifting price restrictions on short-selling constraints, increase arbitrage opportunities, while Schleifer and Vishny (1997) found that capital constraints may limit traders' ability to enforce arbitrage boundaries.

Kawaller, Koch, and Koch (1987), Cornell and French (1983), and Stoll and Whaley (1990) identify and measure arbitrage boundaries defined by the inclusion of various transaction costs. While explicit transaction costs and the implicit costs of trading may account for some portion of the spreads, the magnitude of the spreads in many markets continues to exceed these boundaries. These studies, however, do not robustly indicate how arbitrage relationships have developed over time, how informed trading affects arbitrage boundary, and how potential changes in the relation between liquidity, volatility and informed trading to basis spreads evolve over the course of market maturation. These are the qualities that are illuminated in this paper.

As pointed out by Brennan and Schwartz (1990), shorting of stock is more costly and difficult to execute than shorting of futures. As such, positive basis spreads should be easier to arbitrage than negative ones although Dwyer, Locke, and Yu (1996) found no such difference in their U.S. data. We found that trading costs playing a role in arbitrage trading is less prevalent when spreads are negative. Wang and Chen (2007) continue to find that positive basis has a greater impact on the spot market than negative basis does, particularly with respect to volatility on spot and futures markets. Chen, Cuny, and Haugen (1995) also claim that if arbitrageurs are dominant and arbitrage boundaries are met, higher stock volatility altering expected returns in the market induces new participants to enter the market and narrows the basis. To test this relationship, we generate four separate measures of intra-day volatility as presented by Andersen, Bollerslev, Diebold, and Labys (2001), Schwert and Seguin (1990), and French, Schwert, and Stambaugh (1987) and generally realized standard deviation. Motivated by the viewpoints of Subrahmanyam (1996) that misinformed speculation can adversely affect volatility and market efficiency, we infer informed speculation in Taiwan that may have a similar effect and hence examine how informed trading, specifically, affects spreads. We then turn our attention to the marginal effects of liquidity, volatility, and informed trading on widening and narrowing basis spreads, respectively. This allows us to explore whether the rate of widening/narrowing is hastening or slowing basis spreads and to confirm whether speculators still dominate arbitrageurs.

Importantly, unlike some previous studies, our paper focuses on the period far from futures contract expiration ("non-expiration" period). We find in directly comparisons that important relations differ during the expiration and non-expiration periods. Indeed, some relations are even inverted. This adds to our understanding of basis spreads both in the findings themselves and in the overall conclusion that spreads, and perhaps traders, behave differently expiration periods.

Finally, in a unique contribution of this paper, we also investigate the role of market maturity in these relations. As Figlewski (1984) points out, it is logical to assume that arbitrage opportunities decrease in more mature markets. By creating a time-series market maturity measure based on a factor analysis of 12 relevant variables including the age of the market, transparency metrics, product expansion metrics, ownership variables, market integration, and relative trading measures, this measure allows us to track basis interactions throughout the course of the market's maturation. When the measure is included in regression models which consist of liquidity, volatility, informed trading, and control variables, we found improvements in market mechanisms. The introduction of new products to improve market completeness and integration seems to help enforce arbitrage boundaries and the size of basis spreads is smaller when the market becomes more mature. Contrary to general findings for developed markets, we found that volatility and liquidity widen spreads, yet informed trading widens only negative spreads, not positive ones. While we cannot specifically identify any of the traders as speculators or arbitrageurs, we conjecture that speculators dominate given the impact of key variables on basis spreads. The results of informed trading are robust to multiple specifications and the dominant speculative trading seems to be uninformed.

The remainder of the paper is presented as follows. In Section 2, we present data, compare the Taiwan futures market to that of the Tokyo Price Index futures, and present our preliminary findings. Section 3 derives market maturity measure. Section 4 reports the main results of our regressions on liquidity, volatility, and market maturity measures on basis spread and compares with the results of the 5 days leading up to expiration. Section 5 discusses robustness checks. Section 6 provides our conclusions.

2. Data and markets

The data used in this study are collected from three sources. Taiwan equity data are collected from the Taiwan Stock Exchange Corporation (TWSE), Taiwan futures data are collected from the Taiwan Futures Exchange (TAIFEX), and Tokyo Price Index (TOPIX) and futures data are collected from Tokyo Stock Exchange (TSE). The TWSE provides data related to the underlying composite index (TAIEX); the data contains transaction-level price and volume, and is recorded to the nearest 0.01. TAIFEX data also contains

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