# NARROW FRAMING: PROFESSIONS, SOPHISTICATION, AND EXPERIENCE

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We document support for the narrow framing effect proposed by Tversky, A. and Kahneman, D. (1981). Our findings that traders in an options market frame complicated investment decisions into simpler ones support the narrow framing effect. Traders' professionalism, sophistication, and trading experience are negatively correlated with the degree of narrow framing, implying that these factors help to reduce investors' behavioral bias. Our study bridges the gap between the psychological literature and financial literature in terms of the relationship between experience/sophistication and narrow framing. The article sheds light on the decision-making process in an options market, and the relationship between

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## INTRODUCTION

Options are important investment financial instruments as their flexibility makes financial markets complete (Brennan & Solanki, 1981; Driessen & Maenhout, 2007; Leland, 1980; Liu & Pan, 2003). Investors can mix and match among different strategies in order to custom tailor a personal trading plan in an options market. However, options' trading involves a multitude of variables and choices, which requires time and practice on the part of investors. Accordingly, options are complicated for those who do not educate themselves on the subject.[1]

Trading in option markets is a more complex affair than trading in stock markets. Chaput and Ederington (2003, 2005a) discuss option trading activities by adopting various option strategies. Their results show that preferences for different types of traders in the Eurodollar options market can be different. Chaput and Ederington (2005b) use options on Eurodollar futures to examine the trading and design of vertical spreads, and find most vertical spread traders prefer to employ out-of-the-money strikes because of their low net prices, low transaction costs, and low likelihood of early exercise. Lakonishok, Lee, Pearson, and Poteshman (2007) analyze option trading strategies, and speculate on the motivations for different types of investors by investigating the detailed activity of option contracts listed on the Chicago Board Options Exchange (CBOE).

Behavioral literature concerning option markets is scarce. Heath, Huddart, and Lang (1999) find firm employees tend to exercise ESOs when the previous monthly return is high, and market stock price is higher than the maximum price of the previous year. Poteshman (2001) provides evidence of short-horizon underreaction and long-horizon overreaction to information listed in S&P 500 index options. Horst and Veld (2008) use call options in the Netherlands to price call warrants, and conclude that the behavioral preference of private investors causes the overvaluation for call warrants. Liu, Tsai, Wang, and Zhu (2006) find that market makers are more likely to take higher risks following morning profits. Haigh and List (2005) use an experimental design to investigate the behavioral difference between professional options and futures traders on Chicago Board of Trade (CBOT) and undergraduate

[1]Examples include writing covered puts and calls, calendar spreads, collars, cross-market spreads, curve trades, and synthetic futures option strategies. (John Person, Hedge Fund Strategies Combining Futures & Options) http://www.cbot.com/cbot/pub/cont_detail/0,3206,929+18713,00.html. Stoll and Whaley (1993) discuss 50 option strategies in their textbook. Doran and Fodor (2008) use 12 of the most common and popular trading strategies over different maturities and moneyness to analyze portfolio returns.

students. Surprisingly, they state that professional options and futures traders exhibit more myopic loss aversion compared with undergraduate students. These studies support the notion that traders may display some behavioral biases in trading options.

Is it possible that investors, even sophisticated traders, use a form of selective simplification in trading options due to the complexities of trading in an options market? Tversky and Kahneman (1981) first introduce decision framing by providing experimental evidence, and they suggest that people tend to simplify complicated phenomena into easily understandable outlines. Thaler (1985) suggests that framing assists in making complicated problems into simpler sub-problems, and thereby decomposes the investment problem into mental accounts. Barberis and Huang (2008) point out that narrow framing (decision-making in isolation) is one of the most important ideas to consider in terms of decision-making under risk.

Although there is plenty of evidence on why people frame narrowly in the psychological literature, we still do not fully know whether or not people frame narrowly in financial markets. Barberis and Huang (2008) further demonstrate that investors exhibiting narrow framing can explain equity premium puzzles. Barberis, Huang, and Thaler (2006) provide a rationale of why investors might focus on annual gains and losses in the stock market. They all suggest that investors isolate their investment decisions in regards to their portfolio and do not concern themselves about the degree of correlation between the portfolio components. Kumar and Lim (2008) find households tend to exhibit narrow framing, and that such traders are more likely to hold more undiversified equity portfolios as well as displaying higher disposition effects. Baily, Kumar, and Ng (2008) find that investors who frame decisions narrowly appear to trade excessively and select high expense mutual funds that detract from performance.

The first contribution of the article is to document the existence of narrow framing in the options markets. The growing literature on behavioral finance has uncovered how framing decisions affect trading behavior in options markets. Using a unique options and futures dataset, we investigate investors' decision-making in trading options. We focus on whether professionals' sophistication and experience help to reduce narrow framing in decision-making. We address this issue by examining whether traders exhibit narrow framing in markets wrought with complex choices: options. Complementary to the findings of Kumar and Lim (2008) regarding the stock market, we find evidence that retail investors exhibit narrow framing more often in an options market compared to foreign investors and local institutions (companies, securities firms; securities investment trust and consulting enterprises; dealers; and brokers of futures commission merchants). After controlling for other factors, our results show that individuals have the smallest trade clustering (TC) measure as proposed by

Kumar and Lim (2008), indicating that retail investors exhibit a strong propensity toward narrow framing. Companies have the second smallest TC, whereas professional institutions (dealers, brokers of futures commission merchants, and securities firms) show the largest TC among all types of investors.

The second contribution of this article is to document the influence of sophistication and/or experience on narrow framing in options markets. Most of the empirical results regarding whether professional sophistication and experience can reduce behavioral biases do exist, but the psychological literature on the relationship between narrow framing and experience is inconclusive.

Results from past empirical studies suggest that professional, sophisticated/experienced investors may reduce their behavioral biases. Shapira and Venezia (2000) suggest that professional investors display a weaker disposition effect than individual investors investing by themselves. Feng and Seashores (2005) find that the combination of investors' sophistication and trading experience can alleviate a disposition effect in financial markets. Dhar and Zhu (2006) and Seru, Shumway, and Stoffman (2006) state that as investors become more experienced, the disposition effect is reduced and portfolio performance improves. Locke and Mann (2005) find that the full-time future traders hold onto losses significantly longer than gains. The successful floor futures traders exhibit trading behavior characterized as rational and disciplined. Moreover, measures of relative trading discipline have predictive power for subsequent trading success. Chen, Kim, Nofsinger, and Rui (2007) find that Chinese individual and institutional investors suffer from behavioral biases (deposition effect, overconfidence, and representative bias), but the former seems more prone to biases than the latter. However, Brown, Chappel, da Silva Rosa, and Walter (2006) infer that the disposition effect is pervasive across investor classes such as individuals, foreigners, and institutions.

In experimental studies, Fagley and Kruger (1986) suggest that experts such as school psychologists do not show narrow framing in choosing programs for high school drop-outs. However, many scholars argue that experience fails to reduce narrow framing. Roszkowski and Snelbecker (1990) indicate that professionals are not immune to framing effects when it comes to financial planning. Levin, Schneider, and Gaeth (1998) find prior experience does not prevent framing effects from taking hold while gambling. Loke and Tan (1992) also find that there is no interaction between experience and framing effect when designing experiments on meat purchases, branch closure, or emergency landings. Our study is an attempt to provide evidence on whether narrow framing is pervasive across different types of investors (including professionals), and whether experienced and/or sophisticated traders will exhibit broader framing traits.

Our article attempts to bridge the gap between narrow framing in psychology and financial economics by highlighting the decision-making (process) in

terms of the options markets. The findings of our study indicate that traders in an options market frame complicated investment decisions into simpler ones, giving support to the narrow framing effect. Complementary to the finds of Kumar and Lim (2008) and Baily et al. (2008) in regards to stocks markets and mutual fund industry, we also demonstrate that in much more complex derivatives markets, traders tend to simplify the complicated trading strategies into easily understandable investment decisions.

We classify five groups of traders based on their occupational categories, including individual traders (INDIVs); local companies (LOCALs); qualified foreign institutional investors (QFIIs); securities investment trust, and consulting enterprises (SITCs); as well as dealers, brokers of futures commission merchants, and securities firms (DBs). Sophisticated traders are measured as those options traders who execute combination orders and futures. Similar to the proxies for trading experience of Dhar and Zhu (2006) and Nicolosi, Peng, and Zhu (2004), we measure experience by the variance of purchase dollar amounts, the number of purchases divided by investors per trading period, and the number of different options purchased divided by investors per trading period.

The results show that sophisticated and/or experienced traders are negatively correlated with the degree of narrow framing. A trader who is more professional, sophisticated, and experienced is less susceptible toward isolating his decision-making sets and tends to form his portfolios by simplifying complicated investment strategies, which implies that these factors can alleviate investor behavioral biases. The fact that different investor characteristics pertain to different degrees of narrow framing reflects the complexity of human behavior, and provides opportunities for further research examining broader financial markets.

The remainder of this article is organized as follows: The section "Literature Review on Narrow Framing" reviews the related literature on decision-making in regards to narrow framing. The section "Hypotheses, Data, and Variables" builds up our hypotheses and presents the data and variables. The section "Empirical Analysis" discusses the empirical findings. We conclude with a brief summary of the study in the last section.

## LITERATURE REVIEW ON NARROW FRAMING

The concept of frames has been developed as an instrument for analysis in various fields, including psychology, sociology, business management, financial investment behavior, negotiation, decision-making, environmental conflict, and beyond. Frames are cognitive shortcuts that people use not only to understand complex information but also to simplify complicated phenomena into more easily understandable components.

Thaler (1985) suggests that framing simplifies complicated problems into simpler sub-problems, and decomposes investment problems into mental accounts. Tversky and Kahneman (1981, p. 453) provide readers with a field of vision for puzzles by filtering perceptions, but also through giving meaning through selective simplification. They note that narrow framing results partly from the formulation of the problem, as well as the norms, habits, and personal characteristics of the decision maker.

A standard framing effect called "*risky choice framing*" occurs when willingness to undergo a risk depends on whether potential outcomes are positively or negatively framed. People are more often willing to take risks with negatively framed outcomes than with positively framed outcomes, as the framing affects people's risk preference. Tversky and Kahneman (1981) conducted a famous Asian disease-like experimental study, which indicated that narrow framers violated the invariance axiom. A second framing effect called "*attribute framing*" influences item appraisal: a key attribute is framed in a positive or negative manner, which in turn affects whether the item itself is appraised as favorable or unfavorable. In the final effect, "*goal framing*," effects occur when persuasive messages have different effects depending on whether they stress the positive consequences of performing an act in pursuit of a goal, or the negative consequences of not performing said act (Levin et al., 1998).

Several experimental studies show that an individual decision maker with a framing effect frequently violates the standard expected utility theory based on the invariance axiom and strict dominance.[2] Simonson (1990, p. 160) uses sequential and simultaneous choices to note that "in addition to simplifying decisions, making multiple choices simultaneously enables consumers to implement, rather easily, global strategies for the different selections." Kahneman and Lovallo (1993) demonstrate that decision makers like narrow framers are extremely liable to consider problems as unique. They isolate current choices from future opportunities and neglect the connection in terms of future choice opportunities, which results in isolation costs.

Traders who make less clustered trades may be more susceptible to narrow framing. By modifying Simonson's (1990) experimental design, Read and Loewenstein (1995) examine whether consumers make choices sequentially or simultaneously, and offer two factors causing diversification bias: time contraction and choice bracketing. Read, Loewenstein, and Kalyanaraman (1999) manipulated Redelmeier and Tversky's (1992) experiment, and found that narrow-bracketing students choose gambles only on the first day, whereas broad-bracketing students choose gambles on all five days.

[2]Kahneman and Tversky (1984), Tversky and Kahneman (1986), Kühberger (1995, 1998), Levin et al. (1998).

Frazzini (2006) reports that narrow framing can occur anytime or across different risky choices. In other words, agents evaluate a gamble in isolation and are indifferent to the correlation between their outcome and their total wealth. They also evaluate their outcome at given time intervals. In sum, all of their studies conclude that narrow framers make their decisions through selective simplification.

A connection between frame decisions and finance was recently proposed. Borrowing from the psychology of decision-making, Benartzi and Thaler (1995) built a model based on loss aversion and mental accounting to successfully explain the equity premium puzzle. Barberis, Huang, and Santos (2001) discuss people's attitudes toward loss aversion in regards to the choices they include in a portfolio. They further discuss how people tend to frame previous outcomes to increase or decrease their degree of loss aversion: people are more likely to add risk after previous gains, and less likely to add risk after previous losses. Lastly, they investigate how narrow framing and loss aversion are related to the equity premium puzzle.

Barberis and Huang (2008) propose an asset allocation model based on investors' utility functions under narrow framing and loss aversion assumptions. In their model, investors evaluate a gamble in isolation, and are sensitive to losses. They use a recursive utility function and modify the narrow framing parameter in the utility function to show an equity premium in the stock market. Later, Barberis et al. (2006) use many different utility functions with narrow framing settings to explain why investors are unwilling to undertake a small and independent gamble, even when this gamble will bring eventual benefits. Magi (2009) also applies narrow framing to set up a model of international portfolio choice, thereby providing a possible explanation for the equity home bias puzzle.

Empirical support for the narrow framing effect is very limited. Lim (2006) suggests that individual traders exhibit mental accounting behavior in stock markets. She analyzes investors to see whether frame gains and losses happen separately, and to see if they are prone to executing trading decisions in order to sell more multiple losers on any given day versus selling winners. Kumar and Lim (2008) investigate individual stock traders' investment decision-making, by adopting the degree of TC as a proxy for the degree of narrow framing. They show that narrow framing traders exhibit the disposition effect more, and hold more undiversified portfolios in stock markets. Baily et al. (2008) find that investors who frame decision narrowly or prefer speculative securities poorly select mutual funds and trade excessively. In this article, we bridge the gap between narrow framing and decision-making in options markets.

## HYPOTHESES, DATA, AND VARIABLES

### Hypotheses

In a more complex derivatives market, we believe that investors are more likely to use selective simplification while trading options. Using the same proxy as Kumar and Lim (2008), we investigate investors' trading behavior in the Taiwan derivatives market. We test three hypotheses regarding investors' behavior in the options market.

***Hypothesis 1***: Traders' professional trading abilities are negatively correlated with the degree of narrow framing. That is to say, individual traders are more susceptible to narrow framing.

A great deal of research reports that professional investors are more rational and show less behavioral bias than do individual investors. We examine not only individuals but also institutional traders to see whether professional traders show less narrow framing. Cho and Jo (2006) and Bloomfield, Libby, and Nelson (1999) suggest that well-informed investors are less prone to overconfidence.

This study classifies five groups of traders by their ID codes, and their occupation categories, including individual traders (INDIVs); local companies (LOCALs); qualified foreign institutional investors (QFIIs); securities investment trusts and consulting enterprises (SITCs); as well as dealers, brokers of futures commission merchants, and securities firms (DBs), which are ranked from the lowest to highest in terms of professional ability. We expect to see in our empirical results that the least professional INDIVs exhibit the narrowest degree of framing, and the most professional DBs exhibit the broadest degree of framing.

***Hypothesis 2***: Sophisticated investors show less narrow framing.

Feng and Seasholes (2005) find sophistication (static differences across investors) eliminates the disposition effect in financial markets. Chaput and Ederington (2003, 2005a) confirm that (1) option traders use combination orders instead of separate orders for each leg to construct their portfolios not due to receiving a lower effective spread, but to eliminate execution risk; (2) volatility traders design straddles or strangles into combination orders with a low delta; and (3) traders add futures to their straddles or strangles position in order to reduce the delta of the position to zero. Therefore, option traders who execute combination orders and futures are more deeply concerned about the correlation between the outcome and risk of their portfolio. Their decision-making

behavior does not exhibit narrow framing. Kumar and Lim (2008) also suggest that the three proxies for individual investors' sophistication: foreign assets trading, short-selling, and option trading are positively correlated with broad framing.

Following the spirit of Chaput and Ederington (2003, 2005a) and Kumar and Lim (2008) closely, we set dummy variables as proxies for sophistication as follows: (1) investors who submit combination orders and (2) option traders who are involved in futures markets. We predict that traders who submit combination orders and trade in the futures market are sophisticated and exhibit less narrow framing.

***Hypothesis 3:*** Investors with more trading experience exhibit less narrow framing.

Knez, Smith, and Williams (1985) note that "most (but not all) experimental markets show some learning effects over time, with equilibrium behavior quite different from start-up behavior." List (2003) finds that traders increase their profits by their trading experience of sports cards. Dhar and Zhu (2006), Feng and Seasholes (2005), and Seru et al. (2006) find that investors with more trading experience exhibit less disposition effects. Furthermore, Nicolosi et al. (2004) suggest that active traders adjust their stock purchases according to their abilities more dramatically than inactive traders. However, Chen et al. (2007) find that experienced Chinese individual investors do not exhibit less of a disposition effect.

Taking into account the variance of purchase dollar amounts, the number of purchases, and the number of different stocks purchased, we measure trading experience by the variance of purchase dollar amounts, the number of purchases divided by investors per trading period, and the number of different options purchased divided by investors per trading period. We argue that traders with more trading experience exhibit less narrow framing.

## Data

We obtained options and futures data from the Taiwan Futures Exchange (TAIFEX) for 1,495 trading days between December 24, 2001 and December 31, 2007. The contracts are Taiwan Stock Exchange Capitalization Weighted Stock Index (TAIEX) options, Taiwan Stock Exchange Electronic Sector Index options (hereafter, TEO), Taiwan Stock Exchange Finance Sector Index options (hereafter, TFO), MSCI Taiwan Index options (hereafter, MSO), Taiwan Stock Exchange NonFinance/NonElectronics Sub-Index options (hereafter, XIO) and GreTai Securities Market Capitalization Weighted Stock Index

options (hereafter, GTO)[3] and all of option contracts are European style options. Our data include identifiers for the traders' ID codes and whether the trade was a buy or sell, as well as the price, the volume, and the time for each transaction. In our sample, there are 16,126 TAIEX options, 1,550 TEOs, 1,370 TFOs, 459 MSOs, 70 XIOs, and 73 GTOs based on different strike prices and maturities.

The trading system of the TAIFEX is an automated electronic trading system. After July 29, 2002, the TAIFEX changed to match orders continuously instead of previously matching orders every ten seconds. Then there emerged two types of orders: market orders and limit orders. As for option contracts, investors can submit not only single orders but also combination orders (including vertical spreads, horizontal spreads, straddles, strangles, conversions, and reversals). The options at TAIFEX may expire in five different delivery-months: the spot month, the next calendar month, and the next three quarter months (March, June, September, and December). The last trading day and the expiration day are the third Wednesdays and Thursdays of each respective month. Trading hours are 08:45a.m.–1:45p.m. Taiwan time, Monday through Friday. (For greater details, please see www.taifex.com.tw.)

Figure 1A shows that the monthly trading volume of the TAIEX index option contracts was low (on average, 130,000 lots) during the first year, 2002. From 2003 on, trading volume increased gradually. In March, 2004, monthly trading volume reached a peak (5,421,000 lots).[4] Table I reports the number of traders in the options market. In total, there were 248,898 traders trading in the options market during the six-year sample period, excluding traders who executed less than or equal to three trades. We divided our option traders into five groups by traders' ID codes. The types of traders include INDIVs, LOCALs, QFIIs, SITCs, and DBs. The number of traders in each group was 247,445, 439, 91, 867, and 110, respectively. We document, in Figure 1B, the monthly number of traders for the five types of traders in the options market. This number increased gradually on average, outside of the number of SITCs.[5] About 1,440 individual traders traded options at the opening of the options market, and the number of traders increased to 46,200 in the last month of 2004.

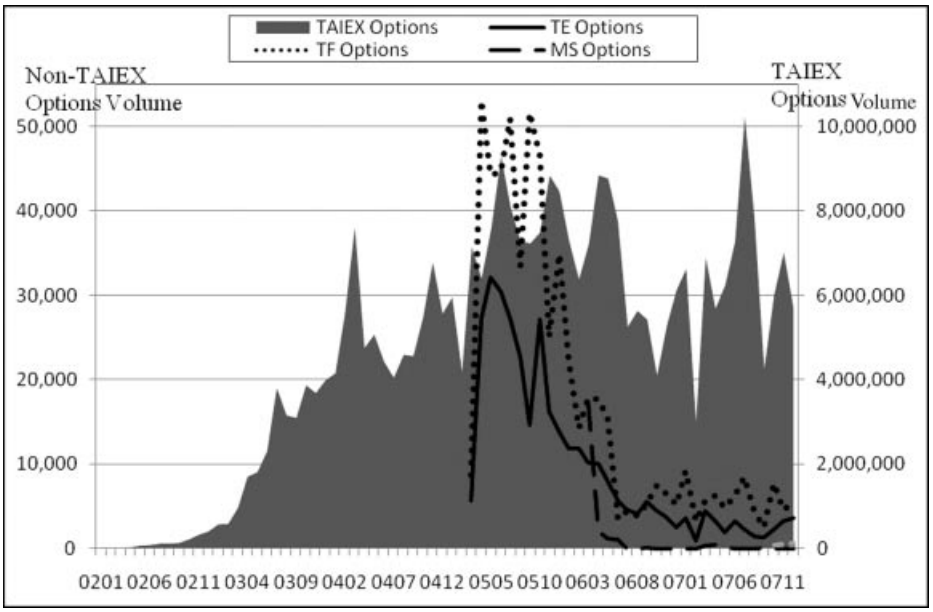
A summary of the number of contracts in the options market is also shown in Table I. In total, there were 19,648 index option contracts. INDIVs traded

[3]The TAIEX index options began trading on the TAIFEX in December 24, 2001, TEO and TFO began trading in March 28, 2005, MSO began trading in March 27, 2006, XIO and GTO began trading in October 8, 2007.

[4]We do not include stock option contracts because they were introduced on January 20, 2003, and compared with index options, the volume of stock options still has room for future growth.

[5]A managed futures enterprise may engage in accepting consignments from specified persons for discretionary futures trading. Many specified persons have opened their accounts from January 2004.

(A)




(B)

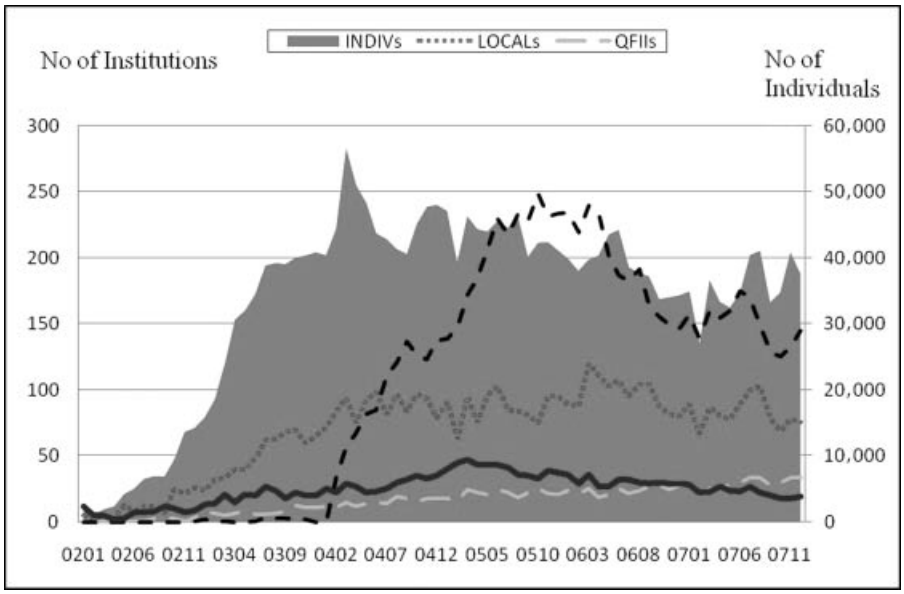



**FIGURE 1**
(A) Volume of option contracts. (B) Number of traders for five types of traders in option markets.

almost widely across many kinds of option contracts (18,672), compared to the other traders. Two thousand six hundred and sventy were TAIEX index option contracts traded by LOCALs. Among all institutions, SITCs were the most selective type of group; they trade 1,532 in index options. Regarding the

**TABLE I**
Summary Statistics of the TAIFEX Options Market

| | *ALL* | *INDIVs* | *LOCALs* | *QFIIs* | *SITCs* | *DBs* |
|---|---|---|---|---|---|---|
| Number of traders | 248,952 | 247,445 | 439 | 91 | 867 | 110 |
| Number of contracts | 19,648 | 18,672 | 2,670 | 2,527 | 1,532 | 6,241 |
| Average daily number of trades per trader | 3.573 | 3.425 | 12.384 | 140.658 | 17.188 | 81.126 |
| Average daily trading volume per trader | 15.823 | 14.477 | 115.910 | 1,465.184 | 86.390 | 888.308 |

*Note.* This table reports the number of contracts, number of traders, the average daily number of trades, and trading volume per trader in the TAIFEX for 1,495 trading days from 2001/12/24 to 2007/12/31, and 19,648 contracts were traded by 248,952 traders in the options market. We focused on traders who had executed a minimum of seven trades during the six-year sample period. ALL are all traders in the options market; INDIVs are individual traders; LOCALs are local companies; including domestic companies, banks, and insurance companies; QFIIs are qualified foreign institutional investors; SITCs are securities firms, and securities investment trusts and consulting enterprises; and DBs are dealers or brokers of futures commission merchants.

average daily number of trades per trader, we found that the averaged daily number was 3.573. The average daily number of trades of TAIEX index option for INDIVs, LOCALs, QFIIs, SITCs, and DBs was 3.425, 12.384, 140.658, 17.188, and 81.126, respectively, in the options market. The daily number of trades was 140.658 for QFIIs, which was the highest among all types of traders, whereas individuals traded only 3.425 times per day. These results indicate that professional traders (QFIIs, SITCs and DBs) traded frequently, and this was especially true for QFIIs.

Table I, also summarizes the average daily volume per trader. The results indicate that the average trading volume per trader in option markets was 15.823 lots. QFIIs had the highest daily volume among all types of traders on average, whereas individuals' daily trading volume was the lowest. In terms of trading volume, professional traders (QFIIs, SITCs, and DBs) also traded quite frequently, especially QFIIs.

## Variables

Read and Loewenstein (1995) and Read et al. (1999) suggested that making decisions in isolation causes more susceptibility to narrow framing than making decisions simultaneously. Kumar and Lim (2008) suggested the idea of "one-trade-a-day" traders, whose trades are less clustered in time and are more susceptible to narrow and developed narrow framing measures, TC, and the index of cluster size (ICS) measure.[6] They found that these investors are susceptible to

[6]The ICS measure is borrowed from spatial analysis literature (Bailey & Gatrell, 1995). If $NT_{it}$ follows a Poisson distribution, meaning that trades are not clustered, i.e., they occur at random, $E_i(NT_{it}) = Var_i(NT_{it})$, and $ICS_i$ is zero, and an investor $i$ is more susceptible to narrow framing. However, there is a greater variance in the number of trades per unit of time when trades are clustered. Therefore, if $Var_i(NT_{it}) > E_i(NT_{it})$, and $ICS_i$ is bigger than zero, an investor $i$ is more susceptible to broad framing.

narrow framing, and therefore exhibit a higher disposition effect, hold relatively more undiversified portfolios, and earn lower average returns. Following Kumar and Lim (2008), we use the measure of TC and the ICS as proxies for the degree of narrow framing of an investor.

$$\mathrm{TC}_i = 1 - \frac{\mathrm{NODAYS}_i}{\mathrm{NOTRADES}_i} \tag{1}$$

where $\mathrm{NODAYS}_i$ is the total number of days on which investor $i$ trades options or futures, and $\mathrm{NOTRADES}_i$ is the total number of option trades executed by investor $i$ during the sample period.

$$\mathrm{ICS}_i = \frac{Var_i(\mathrm{NT}_{it})}{E_i(\mathrm{NT}_{it})} - 1 \tag{2}$$

where $\mathrm{NT}_{it}$ is the number of option trades executed by investor $i$ on day $t$. The mean and the variance of $\mathrm{NT}_{it}$, $E_i(\mathrm{NT}_{it})$, and $Var_i(\mathrm{NT}_{it})$ are estimated using all trades executed by investor $i$ during sample period.

The minimum TC measure is zero when the total number of days an investor $i$ trades options equals the total number of option trades executed by investor $i$ during the sample period. Investor $i$ is then a one-trade-a-day trader whose trades are less clustered in time, and as such is more susceptible to narrow framing. On the other hand, if the TC measure is much bigger than zero, then investor $i$ is more susceptible to broad framing. Kumar and Lim (2008) also use purchases instead of all trades to calculate *TC* as another measure,[7] a measure we also adopted in our article.

To capture option characteristics, we also controlled any for front month effect and moneyness. The *Front month ratio*$^1$ (*Front month ratio*$^2$) is defined as the number of trades (trading volume) of options contracts within one month of expiration executed by an investor during the whole sample period divided by the total number of trades (trading volume) of options contracts executed by an investor during the whole sample period. The *Near the money ratio*$^1$ (*Near the money ratio*$^2$) is defined as the number of trades (trading volume) of option contracts which are near-the-money executed by an investor during the whole sample period divided by the total number of trades (trading volume) of option contracts executed by an investor during the whole sample period.[8] The *Call ratio*$^1$ (*Call ratio*$^2$) is defined as the modulus of difference of the number of trades (trading volume) of call option contracts executed by an investor during the whole sample period divided by the total number of trades (trading volume)

[7]We also use sales instead of all trades to calculate $\mathrm{TC}_i^s$, and results are similar to $\mathrm{TC}_i^p$.
[8]Near-the-money option contracts are defined as $0.95 <$ moneyness $< 1.05$.

of option contracts executed by an investor during the whole sample period and 0.5. Investors may tend to trade calls or puts. If they have preferences only in calls or puts, the *Call ratio* $^{1}$ (*Call ratio*$^{2}$) will be equal to one. If they trade calls and puts at about an equal rate, the *Call ratio*$^{1}$ (*Call ratio*$^{2}$) will be equal to zero.

Investors may trade options for purposes of speculation, hedging, or arbitrage. A sophisticated investor may trade in both the options and futures market at the same time to hedge their position or to take advantage of arbitrage opportunities arising from the mispricing of these two markets. In our study, the *Option ratio*$^{1}$ (*Option ratio*$^{2}$) is defined as the number of trades (trading volume) of option contracts executed by an investor during whole sample period divided by total number of trades (trading volume) of option and future contracts executed by an investor during whole sample period. *Dumfut* is a dummy variable that equals 1 if traders trade in both option and futures markets, and 0 if otherwise. We believe that traders who place combination orders tend to be more sophisticated than who do not. *Dumc* is a dummy variable that equals 1 if traders have submitted combination orders in an options market, and 0 if otherwise.

We predict that the *Front month ratio*$^{1}$ (*Front month ratio*$^{2}$) will be negatively correlated with TC because broad framing traders may tend to consider their long horizontal positions and calendar effects and therefore execute not only front month but also far month contracts. The *Near the money ratio*$^{1}$ (*Near the money ratio*$^{2}$) will be negatively related with TC because, as Koch and Lazarov (2007) suggested, there is a clustering of trading activity in DAX index options markets especially among options with close strike prices. We also forecast the *Call ratio*$^{1}$(*Call ratio*$^{2}$) will be negatively related with TC, because most broad framing investors trade calls and puts at an equal rate so that their directional risk will be smaller, and their trading strategies are not so close to speculation.

*Dumfut* is positively related with TC because broad framing traders making their investment decisions in both markets are more sophisticated, and consequently should give more consideration to combining futures and options trading strategies to form their portfolios. Chaput and Ederington (2003) also suggest that traders add futures to their straddles/strangles position in order to reduce the delta of the position to zero. *Dumc* and TC are positively related because broad framing investors should consider more than two different contracts at the same time to execute the combination orders, and they need further education to learn the principle of combination strategies.

Our focus on narrow framing is to study whether experience and sophistication helps to eliminate behavioral bias. We use three variables in our proxy experience. *Experience*$^{1}$ is defined as the logarithm of the variance of purchase dollar amounts; *Experience*$^{2}$ is the number of purchases divided by the investor trading period; and *Experience*$^{3}$ is the number of different option contracts purchased divided by investors per trading period. Dhar and Zhu (2006),

Feng and Seasholes (2005), and Seru et al. (2006) all find that trading experience can alleviate behavioral bias, so we forecast $Experience^1$, $Experience^2$, and $Experience^3$ will all be positively related with TC, meaning traders with abundant trading experience can alleviate narrow framing effects.

We dummy five types of traders as follows: *LOCAL*, *QFII*, *SITC*, and *DB* are all dummy variables, which equal 0 if a trader is an individual. *LOCAL* equals 1 and *QFII*, *SITC*, and *DB* all equal 0 if a trader is a local company. *QFII* equals 1 and *LOCAL*, *SITC*, and DB all equal 0 if a trader is a qualified foreign institution investor. *SITC* equals 1 and *LOCAL*, *QFII*, and *DB* all equal 0 if a trader is a securities investment trust and consulting enterprise. *DB* equals 1 and *LOCAL*, *QFII*, and *SITC* all equal 0 if a trader is a dealer or broker of futures commission merchants or securities firms. We assume traders' professional trading abilities are negatively related with the degree of narrow framing. Therefore, we predict that the rank of the degree of narrow framing from the highest to the lowest will be *INDIV*s, *LOCAL*s, *QFII*s, *SITC*s, and *DB*s.

## EMPIRICAL ANALYSIS

We first relate the degree of narrow framing for all types of investor by four measures. Table II presents TC measures (TC, $TC_P$) and indices of cluster size (ICS, $ICS_P$) for the five types of traders who executed at least four trades. The mean of TC measure for all traders in option markets was 0.266 (median = 0.250), which means that an option trader executes ten trades over 7.34 trading days on average. The minimum value of TC was zero. We found that about 20% of traders in the options market have a zero TC measure, meaning that this type of trader places an average of one trade a day. Such investors are susceptible to a severe degree of narrow framing. Comparing narrow framing among groups of traders, the percentage of a zero TC measure was 11.7, 8.2, 11.0, 9.3, and 4.5%, respectively, for INDIVs, LOCALs, QFIIs, SITCs, and DBs. This seems to imply that individual traders have the greatest propensity for narrow framing.

For each group, the mean (median) TC measure of INDIVs, LOCALs, QFIIs, SITCs, and DBs was 0.265(0.250), 0.333 (0.330), 0.503 (0.500), 0.507 (0.571), and 0.591 (0.639), respectively. *F*-statistics and Kruskal–Wallis test reject equality of means and medians among five groups. The mean values of TC for professional traders such as QFIIs, SITCs, and DBs were larger than those of INDIVs and LOCALs, which is consistent with hypothesis 1. All of the TC measures for QFIIs, SITCs, and DBs were greater than or equal to 0.5. In other words, these three types of traders executed an average of two trades a day. Consequently, they are inclined to a broader degree of framing in their investment decisions.

**TABLE II**
Trade Clustering Measures and Index of Cluster Size

| | *Mean* | *Median* | *Std. Dev.* | *Min* | *Max* |
|---|---|---|---|---|---|
| *TC* | | | | | |
| ALL | 0.266 | 0.250 | 0.183 | 0.000 | 0.980 |
| INDIVs | 0.265 | 0.250 | 0.182 | 0.000 | 0.943 |
| LOCALs | 0.333 | 0.330 | 0.204 | 0.000 | 0.864 |
| QFIIs | 0.503 | 0.500 | 0.245 | 0.000 | 0.980 |
| SITCs | 0.507 | 0.571 | 0.255 | 0.000 | 0.960 |
| DBs | 0.591 | 0.637 | 0.249 | 0.000 | 0.980 |
| *F*-stat/$\chi^2$ | 549.9*** | 1,141.4*** | | | |
| $TC_P$ | | | | | |
| ALL | 0.188 | 0.167 | 0.164 | 0.000 | 0.972 |
| INDIVs | 0.187 | 0.167 | 0.163 | 0.000 | 0.941 |
| LOCALs | 0.248 | 0.248 | 0.184 | 0.000 | 0.769 |
| QFIIs | 0.399 | 0.407 | 0.256 | 0.000 | 0.972 |
| SITCs | 0.388 | 0.409 | 0.245 | 0.000 | 0.909 |
| DBs | 0.493 | 0.500 | 0.255 | 0.000 | 0.966 |
| *F*-stat/$\chi^2$ | 496.4*** | 885.1*** | | | |
| *ICS* | | | | | |
| ALL | 0.635 | 0.458 | 0.721 | −1.000 | 52.407 |
| INDIVs | 0.629 | 0.456 | 0.688 | −1.000 | 24.419 |
| LOCALs | 0.852 | 0.658 | 0.824 | −0.857 | 6.155 |
| QFIIs | 2.580 | 1.426 | 5.935 | −0.019 | 52.407 |
| SITCs | 1.633 | 1.324 | 1.558 | −0.750 | 24.000 |
| DBs | 3.822 | 2.192 | 6.123 | −0.011 | 50.676 |
| *F*-stat/$\chi^2$ | 1,239.9*** | 859.2*** | | | |
| $ICS_P$ | | | | | |
| ALL | 0.409 | 0.270 | 0.556 | −1.000 | 37.176 |
| INDIVs | 0.405 | 0.269 | 0.536 | −1.000 | 31.056 |
| LOCALs | 0.593 | 0.426 | 0.674 | −0.778 | 5.223 |
| QFIIs | 1.758 | 0.901 | 4.189 | −0.500 | 37.176 |
| SITCs | 1.024 | 0.796 | 1.005 | −0.500 | 10.000 |
| DBs | 2.616 | 1.454 | 4.261 | −0.008 | 30.278 |
| *F*-stat/$\chi^2$ | 922.1*** | 726.8*** | | | |

*Note.* We calculated summary statistics for four trade clustering measures (TC, TCP, ICS, ICSP) among five types of investors in an options market. TC is defined as, TC$i$ = 1-(NODAYS$_i$)/(NOTRADES$_i$), where NODAYSi is the total number of days on which investor i traded options and NOTRADESi is the total number of option trades by investor i. We then only used purchases to calculate the second measure, $TC_P$, which is similar to TC. We define the third measure as ICS = $Var(NT_{it})/E(NT_{it}) - 1$, where $NT_{it}$ is the number of option trades by trader $i$ on day $t$. $E(NT_{it})$ and $Var(NT_{it})$ stand for the mean and the variance of the $NT_{it}$ variable, respectively. We then only used purchases to calculate the last measure, $ICS_P$, which is similar to ICS. We use Kruskal-Wallis test to test equality of medians. ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

The other three measures that determine the degree of narrow framing are $TC_P$, ICS, and $ICS_P$. The results of *F*-test and Kruska–Wallis test for equality of means and medians among five trader groups are reported for three measures. Basically, we found that professional traders are subject to less narrow framing, consistent with our aforementioned results using TC. For example, the mean value of ICS for all traders in option markets was 0.635 (median = 0.458). For each group, the mean (median) of ICS of INDIVs, LOCALs, QFIIs, SITCs, and DBs was 0.629 (0.456), 0.852 (0.658), 2.580 (1.426), 1.633 (1.324), and

**TABLE III**
Trading Pattern for Traders' Behavior

| | *Mean* | *Median* | *Std.* | *Max* | *Min* |
|---|---|---|---|---|---|
| *Trading pattern for traders' behavior in option market* | | | | | |
| Front month ratio[1] | 0.875 | 0.927 | 0.161 | 1.000 | 0.000 |
| Front month ratio[2] | 0.885 | 0.938 | 0.157 | 1.000 | 0.000 |
| Near-the-money ratio[1] | 0.785 | 0.857 | 0.226 | 1.000 | 0.000 |
| Near-the-money ratio[2] | 0.772 | 0.852 | 0.238 | 1.000 | 0.000 |
| Call ratio[1] | 0.216 | 0.181 | 0.160 | 0.500 | 0.000 |
| Call ratio[2] | 0.228 | 0.199 | 0.161 | 0.500 | 0.000 |
| Option ratio[1] | 0.747 | 0.953 | 0.326 | 1.000 | 0.000 |
| Option ratio[2] | 0.809 | 0.981 | 0.282 | 1.000 | 0.000 |
| Experience[1] | 17.220 | 17.122 | 2.216 | 29.144 | 1.427 |
| Experience[2] | 0.517 | 0.193 | 2.359 | 607.633 | 0.001 |
| Experience[3] | 0.130 | 0.081 | 0.208 | 36.000 | 0.001 |

*Note.* We calculated every variable per trader based on number of trades and trading volume. The *Front month ratio*[1] (*Front month ratio*[2]) is defined as the number of trades (trading volume) of option contracts within one month of expiration executed by an investor during whole sample period divided by the total number of trades (trading volume) of option contracts executed by an investor during whole sample period. *Near the money ratio*[1] (*Near the money ratio*[2]) is defined as number of trades (trading volume) of option contracts, which are near-the-money ($0.95 <$ moneyness $< 1.05$) executed by an investor during whole sample period divided by total number of trades (trading volume) of option contracts executed by an investor during whole sample period. *Call ratio*[1] (*Call ratio*[2]) is defined as absolute value of difference of number of trades (trading volume) of call option contracts executed by an investor during whole sample period divided by total number of trades (trading volume) of option contracts executed by an investor during whole sample period and 0.5. *Option ratio*[1] (*Option ratio*[2]) is defined as number of trade (trading volume) of option contracts executed by an investor during whole sample period divided by total number of trades (trading volume) of option and future contracts executed by an investor during whole sample period. *Experience*[1] is defined as logarithm of the variance of purchase dollar amounts. *Experience*[2] is defined as the number of purchases divided by investors per trading period. *Experience*[3] is defined as the number of different options purchased divided by the number of investors in each trading period.

3.822 (2.192), respectively. Kumar and Lim (2008) studied narrow framing using household data, and our results show individuals are prone to narrow framing, while supporting retail investors also had a tendency toward narrow framing in options markets. In addition, our article provides evidence that professional traders have a propensity for broader framing.

What kind of option contracts do investors prefer to trade? Table III, Panel A describes the trading patterns for different types of traders in option markets. We first analyze whether traders tend to trade front month contracts.

The mean value of the *Front month ratio*[1] (*Front month ratio*[2]) is 0.875 (0.885), indicating that traders execute 87.5% of the trades that belong to front month contracts. This implies that traders in option markets trade front month contracts quite often. The mean value of the *Near the money ratio*[1] (*Near the money ratio*[2]) is 0.785 (0.772), which indicates that traders in option markets prefer to trade near-the-money contracts. Consistent with Koch and Lazarov's (2007) findings, there is a clustering of trading activity in option markets especially when options are near-the-money. The mean value of the *Call ratio*[1]

(*Call ratio*$^2$) is 0.216 (0.228), revealing that traders in option markets do not trade call/put contracts to such a great degree. In general, most investors in our sample preferred to trade front month or near-the-money.

We also explore for sophistication and experience effects using an Option ratio and the three experience proxies in Table IV. The mean value of the *Option ratio*$^1$ (*Option ratio*$^2$) is 0.747 (0.809), meaning that options traders who trade both options and futures contracts trade option contracts more frequently than futures contracts. Over ten trades (10 lots), these options traders execute 7.47 (8.09 lots of) option contracts and 2.53 (1.91 lots of) futures contracts. Regarding percentages of trading in a futures market for option traders, the value is 51%, which suggests that almost half of the investors are trading in both the options and futures markets.

Nicolosi et al. (2004) indicate that the variance of purchase dollar amounts is the most accurate measure toward proxy trading experience. Regarding experience, we adopted three measures. The first proxy is the logarithm of variance of purchase dollar amounts. The mean of *Experience*$^1$ was 17.220. This means that the average variance of purchase dollar amounts per trader is $10^{17.220}$. The mean value of *Experience*$^2$ is 0.517, which means that an option trader executes 5.17 purchases over a ten-day trading period. The mean of *Experience*$^3$ is 0.130, indicating that an option trader purchases 1.30 types of different option contracts over a ten-day trading period.

For all traders, we sort them into five quintiles by investors' TC. Then we list the percentage of traders in each quintile for different groups: *INDIV, LOCAL QFII, SITC, DB, Futures Market*, and *Combination* in Table IV, Panel A. We also report the means of *Option ratio*$^1$, *Option ratio*$^2$, *Experience*$^1$, *Experience*$^2$, and *Experience*$^3$ in each quintile.

The "narrow framing traders" in the lowest TC quintile are susceptible to exhibiting the highest degree of narrow framing. On the other hand, the "broad framing traders" in the highest TC quintile are susceptible to exhibiting the lowest degree of narrow framing.[9] Interestingly enough, we find that the percentage of TC quintile of each type of trader is greater if the traders' professional ability is greater. The number of broad framing *LOCAL, QFII, SITC*, and *DB* traders is on average greater than the number of narrow framing *LOCAL, QFII, SITC*, and *DB* traders (0.394 versus 0.123, 0.692 versus 0.110, 0.678 versus 0.118, and 0.809 versus 0.055). This supports our hypothesis that more professional investors are more susceptible to exhibiting a lower degree of narrow framing. Not surprisingly, the number of broad framing *INDIV* traders is almost

[9]Kumar and Lim (2008) suggest that narrow framers who execute separate trades are susceptible to framing an investment decision more narrowly than broad framers who execute clustered trades.

**TABLE IV**

Trade Clustering and Investor Characteristics

| | *INDIVs* | *LOCALs* | *QFIIs* | *SITCs* | *DBs* | *Futures Market* | *Combination* | *Option Ratio*[1] | *Option Ratio*[2] | *Experience*[1] | *Experience*[2] | *Experience*[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *TC quintile* | | | | | | | | | | | | |
| Narrow framers (0 = TC <= 0.1) | 0.201 | 0.123 | 0.110 | 0.118 | 0.055 | 0.189 | 0.062 | 0.654 | 0.723 | 16.583 | 0.310 | 0.074 |
| D2 (0.1 <= TC <= 0.2) | 0.201 | 0.134 | 0.000 | 0.035 | 0.036 | 0.193 | 0.125 | 0.710 | 0.778 | 16.891 | 0.196 | 0.072 |
| D3 (0.2 < TC <= 0.3) | 0.201 | 0.173 | 0.055 | 0.057 | 0.036 | 0.198 | 0.194 | 0.747 | 0.812 | 17.161 | 0.295 | 0.099 |
| D4 (0.3 < TC <= 0.429) | 0.200 | 0.175 | 0.143 | 0.113 | 0.064 | 0.204 | 0.277 | 0.787 | 0.847 | 17.490 | 0.460 | 0.137 |
| Broad framers (TC > 0.429) | 0.198 | 0.394 | 0.692 | 0.678 | 0.809 | 0.215 | 0.342 | 0.839 | 0.887 | 17.971 | 1.324 | 0.269 |
| No. of traders | 247,445 | 439 | 91 | 867 | 110 | 139,241 | 38,568 | 248,952 | 248,952 | 248,314 | 248,647 | 248,647 |
| *F*-stat | | | | | | | | 2,449.0*** | 2,561.6*** | 3,059.8*** | 1,958.2*** | 8,831.5*** |
| *ICS quintile* | | | | | | | | | | | | |
| Narrow framers (ICS <= 0.128) | 0.200 | 0.144 | 0.132 | 0.129 | 0.055 | 0.685 | 0.056 | 0.671 | 0.740 | 16.722 | 0.419 | 0.094 |
| D2 (0.128 < ICS <= 0.34) | 0.201 | 0.141 | 0.011 | 0.060 | 0.027 | 0.706 | 0.122 | 0.715 | 0.783 | 16.923 | 0.244 | 0.078 |
| D3 (0.34 < ICS <= 0.594) | 0.201 | 0.155 | 0.077 | 0.088 | 0.055 | 0.716 | 0.182 | 0.745 | 0.810 | 17.144 | 0.332 | 0.104 |
| D4 (0.594 < ICS <= 1.001) | 0.200 | 0.219 | 0.154 | 0.151 | 0.064 | 0.731 | 0.264 | 0.779 | 0.837 | 17.393 | 0.513 | 0.144 |
| Broad framers (ICS > 1.001) | 0.198 | 0.342 | 0.626 | 0.572 | 0.800 | 0.773 | 0.376 | 0.827 | 0.877 | 17.914 | 1.076 | 0.231 |
| No. of traders | 247,445 | 439 | 91 | 867 | 110 | 13,9241 | 38,568 | 248,952 | 248,952 | 248,314 | 248,647 | 248,647 |
| *F*-stat | | | | | | | | 1,696.5*** | 1,735.6*** | 2,235.1*** | 978.4*** | 4,609.5*** |

*Note.* This table reports the number of traders and the mean investor characteristics across TC groups. Based on ranking TC and ICS, we sorted the whole sample into five investor groups. There were 49,790 traders each group in the options market. INDIVs is the percentage of individual traders, LOCALs is the percentage of local companies, QFIIs is the percentage of qualified foreign institution investors, SITCs is the percentage of securities investment trust and consulting enterprises, and DBs is the percentage of dealers and brokers of futures commission merchants, securities firms. Futures Market is the percentage of traders who trade in both option and futures markets. Combination is the percentage of traders that have summated combination orders in the option market. *F*-statistics report tests of equality among the mean variables.

equal to the number of narrow framing *INDIV* traders (0.198 versus 0.201). The value of narrow framing for *INDIV*s scatters equally across five categories.

Furthermore, in our whole option sample, 56% of traders traded in both option and futures markets and 27% of traders submitted combination orders in option markets. Besides, the percentage of *INDIV*s, *LOCAL*s, *QFII*s, *SITC*s, and *DB*s trading in both markets was 56, 80, 93, 93, and 100%, respectively. It seems that the degree of professional ability of traders is greater, and the percentage of the population who trade in both markets is larger. This implies that sophistication is positively correlated with how professional a trader is. We further investigated another sophisticated factor—combination orders. The percentage of *INDIV*s, *LOCAL*s, *QFII*s, *SITC*s, and *DB*s submitting combination orders in option markets was 15, 18, 16, 10, and 32, respectively. Furthermore, a higher proportion of broad framing traders are likely to trade in both options and futures markets and tend to submit combination orders compared to narrow framing traders (0.219 versus 0.179, 0.380 versus 0.053). Broad framing traders prefer to execute more complex trading strategies, supporting our hypothesis that sophisticated investors show less narrow framing.

The results of *F*-statistics show that the means of $Option\ ratio^1$, $Option\ ratio^2$, $Experience^1$, $Experience^2$, and $Experience^3$ in each quintile are not equal. The mean of the $Option\ ratio^1$ ($Option\ ratio^2$) of broad framing traders was 0.839 (0.887), implying that broad framing option traders in both option and futures markets trade option contracts more often than futures contracts. Over ten executed trades (10 lots), 8.39 (8.87 lots of) were option contracts and 1.61 (1.13 lots of) were futures contracts. The mean of the $Option\ ratio^1$ ($Option\ ratio^2$) of narrow framing traders was 0.654 (0.723), indicating that narrow framing option traders in both option and futures markets also often trade option contracts more than futures contracts. Over ten executed trades (10 lots), 6.54 (7.23 lots of) were option contracts and 3.56 (2.77 lots of) were futures contracts whereas the mean of the $Option\ ratio^1$ ($Option\ ratio^2$) of broad framing traders was 0.839 (0.887). The narrow framing option traders in both markets seemed to trade fewer options than broad framing traders. Respecting trading experience, we used three proxies, $Experience^1$, $Experience^2$, and $Experience^3$ to measure traders' experience. All of them showed that broad framing traders had greater experience than narrow framing traders (17.971 versus 16.583, 1.324 versus 0.310, 0.269 versus 0.074), supporting our hypothesis that investors with more trading experience show less narrow framing. Consistent with the findings of Dhar and Zhu (2006), Feng and Seasholes (2005), and Seru et al. (2006), more experienced traders help alleviate behavioral bias.

We use another measure, ICS, to sort the traders in option markets. The definitions of "narrow framing traders" and "broad framing traders" are similar to

TC. The "narrow framing traders" in the lowest ICS quintile tend to exhibit the highest degree of narrow framing. On the other hand, the "broad framing traders" in the highest ICS quintile exhibited the lowest degree of narrow framing. Interestingly, we can find that the ICS quintile of each type of trader was greater if the traders' professional abilities were greater. In addition, a higher percentage of broad framing traders were likely to trade in both options and futures markets and submitted more combination orders than narrow framing traders (0.773 versus 0.685, 0.376 versus 0.056). This demonstrates that sophisticated investors exhibit less narrow framing. Not surprisingly, broad framing traders have greater experience than narrow framing traders (17.914 versus 16.722, 1.076 versus 0.419, and 0.231 versus 0.094) as measured by ICS.

The correlation matrix of variables in an options market is shown in Table V. We found that the correlation between TC and ICS was 0.818, which was statistically significant at the 1% level. The correlations between *Option ratio*$^1$ (*Option ratio*$^2$) and TC were 0.200 (0.203), supporting the notion that traders who trade a higher percentage of options than futures were broader framing investors. Finally, the correlation between *Experience*$^1$ (*Experience*$^2$, *Experience*$^3$) and TC is 0.231 (0.186, 0.364), meaning that investors with more trading experience display less narrow framing. The correlations between ICS and the other variables behaved similarly.

We conduct simple regressions, and these can be seen in Table VI. All variables except the dummy variables of *LOCAL*, *QFII*, *SITC*, *DB*, *Dumc*, and *Dumfut* were standardized to control for trader heterogeneity. We found that the coefficients of *LOCAL*, *QFII*, *SITC*, and *DB* were positive and ascending, suggesting that the aforementioned more professional institutions are prone to be less narrow framing than individuals. The coefficients of *Dumfut* and *Dumc* were positive and statistically significant. This indicates that sophisticated traders have a propensity toward broader framing. Dhar and Zhu (2006),

**TABLE V**
Correlation Matrix of Variables in Option Markets

| | *ICS* | *Option Ratio*$^1$ | *Option Ratio*$^2$ | *Experence*$^1$ | *Experience*$^2$ | *Experience*$^3$ |
|---|---|---|---|---|---|---|
| TC | 0.818*** | 0.200*** | 0.203*** | 0.231*** | 0.186*** | 0.364*** |
| ICS | | 0.133*** | 0.133*** | 0.188*** | 0.215*** | 0.315*** |
| Option ratio$^1$ | | | 0.955*** | −0.088*** | 0.031*** | 0.089*** |
| Option ratio$^2$ | | | | 0.034*** | 0.041*** | 0.081*** |
| Experience$^1$ | | | | | 0.109*** | 0.044*** |
| Experience$^2$ | | | | | | 0.354*** |

*Note.* This table reports the correlation matrix of variables in options markets. *** denotes significance at the 1% level.

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**TABLE VI**
Simple Regression Estimates

| | *1* | | *2* | | *3* | | *4* | | *5* | | *6* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Variable* | *Coeff* | *t-Stat* | *Coeff* | *t-Stat* | *Coeff* | *t-Stat* | *Coeff* | *t-Stat* | *Coeff* | *t-Stat* | *Coeff* | *t-Stat* |
| *Dependent variable: trade clustering (TC) measure of a trader* | | | | | | | | | | | | |
| Intercept | −0.007 | −3.374*** | −0.143 | −47.95*** | 0.001 | 0.438 | 0.0001 | 0.065 | 0.0001 | 0.069 | 0.0001 | 0.078 |
| LOCAL | 0.458 | 8.792*** | | | | | | | | | | |
| QFII | 1.348 | 9.507*** | | | | | | | | | | |
| SITC | 1.325 | 27.91*** | | | | | | | | | | |
| DB | 1.860 | 14.50*** | | | | | | | | | | |
| Dumc | | | 0.588 | 113.2*** | | | | | | | | |
| Dumfut | | | 0.093 | 23.64*** | | | | | | | | |
| Experience[1] | | | | | 0.231 | 115.7*** | | | | | | |
| Experience[2] | | | | | | | 0.186 | 3.655*** | | | | |
| Experience[3] | | | | | | | | | 0.364 | 8.343*** | | |
| Front month ratio[1] | | | | | | | | | | | −0.075 | −35.60*** |
| Near-the-money ratio[1] | | | | | | | | | | | 0.014 | 6.983*** |
| Call ratio[1] | | | | | | | | | | | −0.331 | −177. 9*** |
| Option ratio[1] | | | | | | | | | | | 0.172 | 97.63*** |
| Adj. $R^2$ | 0.009 | | 0.048 | | 0.053 | | 0.035 | | 0.133 | | 0.152 | |
| *F*-value | 542.0*** | | 6,328.1*** | | 13,969.3*** | | 8,916.3*** | | 38,015.1*** | | 11,151.2*** | |
| *N* | 248,952 | | 248,952 | | 248,952 | | 248,952 | | 248,952 | | 248,952 | |

*Note.* This table reports simple regression estimates in the options market. All variables except the dummy variables of *LOCAL, QFII, SITC, DB, Dumc*, and *Dumfut*, are standardized and the coefficient estimates are corrected for heteroskedasticity. *** denotes significance at the 1% level.

**TABLE VII**
Multiple Regression Estimates

| | *1* | | *2* | | *3* | |
|---|---|---|---|---|---|---|
| *Variable* | *Coeff* | *t-Stat* | *Coeff* | *t-Stat* | *Coeff* | *t-Stat* |
| *Dependent variable: trade clustering (TC) measure of a trader* | | | | | | |
| Intercept | −0.309 | −89.75*** | −0.352 | −63.35*** | −0.354 | −88.82*** |
| LOCAL | 0.269 | 6.262*** | 0.390 | 7.734*** | 0.403 | 9.835*** |
| QFII | 1.067 | 9.514*** | −0.770 | −1.160 | 1.043 | 8.559*** |
| SITC | 1.035 | 27.50*** | 0.903 | 11.33*** | 0.874 | 19.34*** |
| DB | 1.465 | 12.95*** | 0.479 | 2.121** | 1.350 | 8.715*** |
| Dumc | 0.329 | 68.79*** | 0.364 | 71.87*** | 0.368 | 82.44*** |
| Dumfut | 0.453 | 86.25*** | 0.522 | 59.73*** | 0.522 | 87.18*** |
| Experience$^1$ | 0.170 | 88.68*** | | | | |
| Experience$^2$ | | | 0.165 | 3.356*** | | |
| Experience$^3$ | | | | | 0.330 | 8.215*** |
| Front month ratio$^1$ | −0.033 | −16.26*** | −0.056 | −26.92*** | −0.047 | −21.19*** |
| Near-the-money ratio$^1$ | −0.039 | −19.81*** | −0.014 | −7.194*** | −0.002 | −0.645 |
| Call ratio$^1$ | −0.269 | −146.6*** | −0.278 | −147.1*** | −0.267 | −133.3*** |
| Option ratio$^1$ | 0.339 | 138.4*** | 0.340 | 69.66*** | 0.318 | 61.90*** |
| Adj. $R^2$ | 0.246 | | 0.245 | | 0.327 | |
| *F*-value | 7,353.1*** | | 7,318.5*** | | 11,003.6*** | |
| *N* | 248,952 | | 248,952 | | 248,952 | |

*Note.* This table reports multiple regression estimates in options market. All variables except the dummy variables of *LOCAL, QFII, SITC, DB, Dumc*, and *Dumfut*, are standardized and the coefficient estimates are corrected for heteroskedasticity. *** denotes significance at the 1% level, ** denotes significance at the 5% level, * denotes significance at the 10% level.

Nicolosi et al. (2004), Feng and Seasholes (2005), and Seru et al. (2006) report trading experience can alleviate behavioral biases. The results of our three experience measures (*Experience*$^1$, *Experience*$^2$, and *Experience*$^3$) reveal that trading experience does affect traders' framed decisions. The more experience a trader has, the less narrow framing he exhibits.

Multiple regressions were performed and are shown in Table VII. We first standardized all variables except the dummy variables *LOCAL*, *QFII*, *SITC*, *DB*, *Dumc*, and *Dumfut,* to control for trader heterogeneity. We also incorporated traders' identifications (*INDIV*, *LOCAL*, *QFII*, *SITC*, and *DB*), trading sophistication (*Dumfut*, *Dumc*) and trading experience (*Experience*$^1$, *Experience*$^2$, *Experience*$^3$) into our regression models at the same time by controlling option trading characteristics (*Front month ratio*, *Near the money ratio*, *Call ratio*, and *Option ratio*). We found that the coefficients of *LOCAL*, *QFII*, *SITC*, and *DB* were positive and ascending, meaning that more professional institutions tend to be less narrow framing than individuals. In addition, the coefficients of *Dumc, Dumfut, Experience*$^1$, *Experience*$^2$, and *Experience*$^3$ were

positive and statistically significant. The multiple regression outputs were consistent with our simple regression results, which supported our main hypotheses. Traders who are professional, sophisticated, and experienced have a propensity for broad framing.

In addition to the above regressions, we also performed robustness checks using ICS as a dependent variable in regressions and obtained consistent results. This article also carries out robustness checks by using the data from 2001–2006 as the independent variables and the data from 2007 to create the dependent variables, and our main results remain unchanged.

## CONCLUSIONS

It is easy to become susceptible to narrow framing when trading in complex derivatives markets. Traders may simplify complicated trading strategies into easily understandable investment decisions when trading in an options market. Most of the literature pertaining to financial markets focuses on the stock markets when discussing the relationship between narrow framing and asset allocation (Barberis & Huang, 2001, 2008; Barberis et al., 2001, 2006; Benartzi & Thaler, 1995). Lim (2006) and Kumar and Lim (2008) provided the first empirical study indicating that frames in stocks market affect investors' trading behavior, and cause some behavioral biases such as mental accounting or disposition effect.

The current study supports the narrow framing effect proposed by Tversky and Kahneman (1981). Our contribution demonstrates that the three characteristics of profession, sophistication, and experience can alleviate narrow framing in an options market. In addition, the availability of this unique data allows us to explicitly investigate options traders to see whether they simplify or isolate their decisions through selective simplifications to deal with these kinds of complicated investment strategies.

Fagley and Kruger (1986), Bloomfield et al. (1999), Shapira and Venezia (2000), Grinblatt and Keloharju (2001), Dhar and Zhu (2006), and Kumar and Lim (2008) support the notion that profession can decrease behavioral biases. Their studies on professions rely on professional jobs being listed as a household occupation category. We further classify our five groups of traders into INDIVs, LOCALs, QFIIs, SITCs, and DBs. Our results support the notion that more professional traders exhibit less narrow framing.

Consistent with Feng and Seasholes (2005) and Kumar and Lim (2008), we also found support for the notion that sophistication can reduce the degree of narrow framing among traders. We suggested two proxies for delineating option trader sophistication: combination orders trading and futures trading, and found that those who enter combination orders or place orders in futures

market show less narrow framing. Past studies demonstrate that experience will improve performance and alleviate some behavioral biases. Our findings also support the notion that experienced options traders are susceptible to broad framing. Decision makers will improve their behavioral biases by learning from their previous errors. We find that options traders alleviate their mistakes by learning from past experience.

The fact that different investors' characteristics have different degrees of narrow framing reflects the complexity of human behavior and provides opportunities for future researchers to examine broader financial markets. Our article attempts to bring the narrow framing of psychology into financial economics in order to highlight issues associated with decision-making in an options market, and bridge the gap between psychological and financial studies by positing that certain types of investor attributes can reduce or even eliminate the degree of narrow framing.

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