



Trading activity in the equity market and its contingent claims: An empirical investigation [☆]



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ABSTRACT

Little is known about the joint dynamics of volume across the various contingent claims on the equity market. We study the time-series of trading activity in the cash S&P 500 index and its derivatives (options, the legacy and E-mini futures contracts, and the ETF), and consider their dynamic relation with the macroeconomy, over more than 3000 trading days during 1997–2009. Legacy futures volume has trended downward while other series have trended upward. Total futures volume has increased, suggesting that the trading in the legacy contract has been at least partially supplanted by trading in the E-mini contract. All series are highly cross-correlated and jointly dependent. Signed and absolute trading activity in contingent claims (most prominently, options) predicts shifts in aggregate state variables such as the short interest rate, and the term and credit spreads, as well as signed and absolute returns around major macroeconomic announcements. Overall, consistent with the informational role of options, their volume innovations have the strongest forecasting ability for fluctuations in the macroeconomic environment.

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1. Introduction

Trading is active in a variety of contingent claims on the *same* underlying cash asset. This multiplicity in volume is inherently puzzling but, to the best of our knowledge, has not been comparatively examined. Various contingent claims would seem to offer similar benefits: exposure to the underlying asset at lower transaction costs and greater leverage. Yet some underlying cash assets are associated with numerous futures contracts, options contracts and exchange traded funds, all trading in significant volume.

Financial economists have made notable progress in pricing contingent claims, but trading volume warrants its own separate examination for at least two reasons. First, trading is costly; the public transfers several billion dollars every year to intermediaries in the form of commissions and bid-ask spreads.³ Second, wider trading activity could be associated with lower costs of capital.⁴

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³ In his AFA presidential address, French (2008) suggests that the cost of price discovery via trading was about \$99 billion in 2006.

⁴ See Datar et al. (1998), and Brennan et al. (1998).

While equity volume is well studied (e.g., Karpoff, 1987), relatively little is known about the joint dynamics of derivatives and cash volume.

Some obvious questions begging for answers include the following. How correlated are trading volume across different contingent claims? How volatile are such volume series? Does trading in some contingent claims forecast the macroeconomy better than trading in others? Providing comprehensive answers to these and other questions for all existing derivatives would be a daunting task, but we hope to take a first step here by linking price formation and macroeconomic variables with trading activity in the cash S&P 500 index and in four distinct types of contingent claims on that index: options, legacy futures, E-mini futures, and exchange traded funds.

Existing research does suggest some scope for derivatives trading. When markets are incomplete, for example, options cannot be replicated by trading in a simple combination of stock and riskless debt as in Black and Scholes (1973); see the analyses of Ross (1976), Hakansson (1982), Naik and Lee (1990), Detemple and Selden (1991), and Pan and Liu, 2003. Also, according to Cao (1999), Biais and Hillion (1994), Back (1993), and Black (1975), informed agents should be able to trade more profitably in options. Indeed, Finucane (1991) and Fleming et al. (1996) show that index options lead the underlying cash asset, suggesting that agents trade on market-wide information in such options.⁶

Options are used for hedging positions in other options and in the underlying.⁷ This suggests that options volume could arise both for informational and risk-sharing reasons. Since volume in the underlying could also arise for similar reasons, an immediate query arises about possible factors that explain trading in options relative to trading in the underlying. Motivated by this query, Roll et al. (2010) study the ratio of equity options volume relative to the underlying stock volume in an effort to ascertain if it is related to hedging and informational proxies. Until now, however, we are unaware of any study of options volume dynamics in conjunction with trading activity in the cash market and in *other* equity derivatives. Such a study could provide insight into whether the informational role of options dominates that of other contingent claims.

Futures contracts would be superfluous in a frictionless world, but Gorton and Pennacchi (1993) and Subrahmanyam (1991) suggest that futures may be preferred by uninformed traders because they are insensitive to firm-specific informational asymmetries. Buttressing this idea, Daigler and Wiley (1999) find that futures volatility is primarily induced by (presumably uninformed) members of the general public. Roll et al. (2007) find that the liquidity of the underlying index influences the pricing gap between the theoretical and observed futures basis, but they do not analyze volume. Allaying concerns that derivatives may attract too many uninformed agents and cause volatility spillovers to the stock market, Bessembinder and Seguin (1992) find that futures volume only has a limited impact on stock volatility. We add to these studies by considering the relations between index futures and other derivatives.

Hasbrouck (2003) uses intraday transactions data to examine the linkages between exchange-traded funds (ETFs) and index futures contracts. His paper is focused on prices, rather than trading activity and he finds that index futures dominate ETFs in price discovery. We supplement his work by considering daily ETF *volume* vis-à-vis prices and volume in the underlying index and in futures and options.

As for cash volume, several previous time-series studies examine short-term patterns in volume or contemporaneous links between volume and other variables such as return volatility. They document a positive correlation between volume and absolute price changes (see Karpoff, 1987, Schwert, 1989, and Gallant et al., 1992). Other papers uncover time-series regularities: Amihud and Mendelson (1987, 1991) find that volume is higher at the market's open, while Foster and Viswanathan (1993) demonstrate a U-shaped intraday volume pattern and lower volume on Mondays. In another line of research, Campbell et al. (1993) and Llorente et al. (2002) analyze the dynamic relation between returns and volume levels. Chordia et al. (2011) attribute the recent increase in cash trading activity to institutions, but they do not consider trends in derivatives volume.

The paucity of theory about the joint dynamics of trading in multiple contingent claims rules out sharp testable hypotheses. Instead, we present an empirical exploration. Beyond analyzing joint time-series properties of the derivatives and cash volume, we aim to suggest some answers to the following questions:

- Are contingent claims substitute or complement to each other and to the cash market? If one derivative gains popularity and substitutes for another (Chowdhry and Nanda, 1991), the two volumes should exhibit opposing trends. On the other hand, if contingent claims act as complementary hedging vehicles and as venues for efficiency-enhancing arbitrage trades (Brennan and Schwartz, 1995; Holden, 1990), volumes should exhibit common trends.
- Do volume innovations in one market lead others? If derivatives attract informed agents due to lower transaction costs and enhanced leverage (e.g., Black, 1975; Chakravarty et al., 2004), then shocks to trading activity in derivatives should forecast those in the cash market, as arbitrageurs trade to close the gap in the cash market with a lag.
- Perhaps most importantly, does trading activity across different contingent claims differentially forecast macroeconomic states? Some derivatives have small contract sizes (e.g., the E-mini and the ETF) and may cater to less-sophisticated retail clientele (Hvidkjaer, 2008). These contracts may play a less material role in forecasting macroeconomic conditions. On the other hand, if options are particularly attractive to agents because of their non-linear payoffs (Cao, 1999) then we would expect to see a greater economic role for options trading activity in forecasting macroeconomic conditions.

⁶ Easley et al. (1998a, 1998b), Chakravarty et al. (2004), Pan and Poteshman (2006), and Ni et al. (2008) show that options trades contain information about future stock price movements. Anthony (1988) indicates that options volume leads stock volume. Cao et al. (2005) demonstrate that options volume predicts returns around takeover announcements, implying the presence of informed traders in the options market prior to corporate events.

⁷ Lakonishok et al. (2007) show that covered call writing, a form of hedging, is one of the most commonly used strategies in options markets.

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