# Discussion of

The Option Market's Anticipation of Information Content in Earnings Announcements

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# Placement in Literature

## Studies of the options market and earnings events

- *First moment studies*: Do options help the stock market discover the directional effect of earnings news?
  - Jennings and Starks (1986); Skinner (1990); Ho (1993); Amin and Lee (1997); Mendenhall and Fehrs (1999); Truong and Corrado (WP 2009)
- *Second moment studies*: Do options anticipate the price volatility of earnings news?
  - Patell and Wolfson (1981); Pan and Poteshman (2008)
- *This study*: Do options anticipate the sensitivity of stock prices to a unit of earnings news?

  AIC = OPTPRC / STDEV

# Necessary to test sensitivity?

Necessary to test OPTPRC and STDEV together rather than separately?

## Depends on objective

- Makes sense if we want a firm- and time-specific *ex ante* ERC
- Makes less sense if we want to understand the *sophistication of the option market*
  - Only the AIC numerator (OPTPRC) reflects activity in the option market
  - *Alternative Specification*

    OPTPRC = f(Persistence, Growth Prospects, etc., STDEV)

    Treat STDEV as a covariate rather than as a scalar.

# What is Corr(OPTPRC, STDEV)?

- Fundamental assumption behind $\frac{\text{OPTPRC}}{\text{STDEV}}$ :

  The numerator is increasing in the denominator

- Additional statistics reported to me by authors:
  - AIC sample: Corr(OPTPRC, STDEV) = -0.06 (significant)
  - CS sample: Corr(OPTPRC, STDEV) = 0.009 (insignificant)

- Suggests that option prices are not "sensitive" to STDEV of analyst forecasts

- Unclear what is achieved by scaling one by the other

# Why are the AIC numerator and denominator uncorrelated?

Possible explanation: Measurement Error in

- OPTPRC as a proxy for the option market's E(|ΔP at EA|)
- STDEV as a proxy for E(|Forecast Error|)

# OPTPRC as proxy for E(|ΔP at EA|)

**Source of measurement error #1:**

*Strange option pricing near expiration*

- Patell and Wolfson (1981) find that implied σ's rise to unrealistic levels near end of option's life
- Suggests these option prices yield poor estimates of E(|ΔP|)

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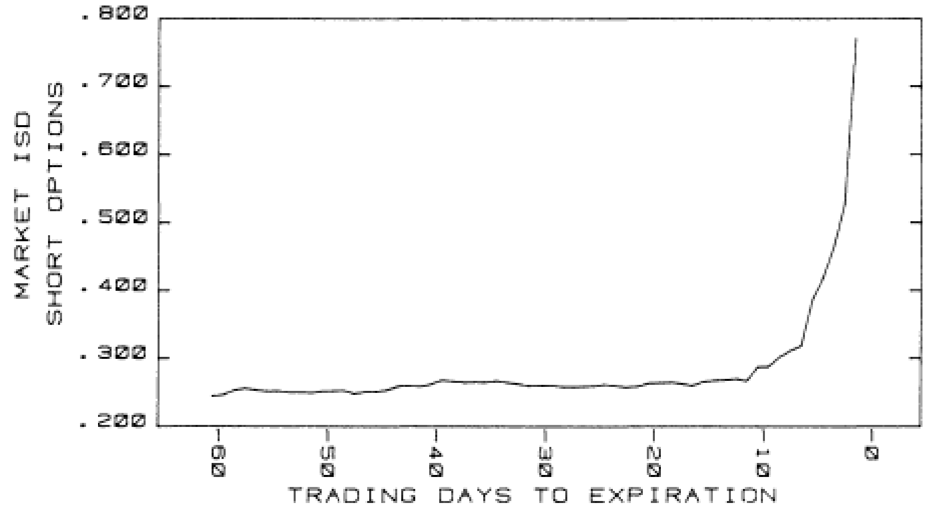


IMPLIED STANDARD DEVIATIONS
NEAR EXPIRATION DATES

FIG. 5

# OPTPRC as proxy for E(|ΔP at EA|)

**Source of measurement error #2:**

*Violation of authors' assumptions*

- In footnote 5, the authors argue that OPTPRC closely varies with E(|ΔP at EA|) if the option
  - A. Is at-the-money
  - B. Expires immediately after the earnings announcement day
- But many options in the sample do not meet these conditions
  - A. Options can be in- or out-of the money by 5 percent
  - B. Options can expire up to 20 days after the earnings announcement

# OPTPRC as proxy for E(|ΔP at EA|)

**A. Effect of not being at-the-money**

*Assume:*

Stock price = $50

σ = .50

Time to expiration = 1 day

*OPTPRC of call option if*

Strike price = $50 (at the money): $0.52

Strike price = $47.50 (95% of stock price): $2.52

# OPTPRC as proxy for E(|ΔP at EA|)

**B. Effect of not expiring until several days after EA**

*Assume:*

Stock price = Strike price = $50

Expected σ during 1-day announcement window = .50

Expected σ after announcement window = .30

Hull and White (1987): σ can be approximated as the expected average volatility over the option's remaining life (T days)

$$\sigma_0^2 = \frac{\sum_{t=1}^{T} E(\sigma_t^2)}{T} = \frac{E(\sigma_{EA}^2 + \sigma_2^2 + \sigma_3^2 + \cdots + \sigma_T^2)}{T}$$

If T=1, then σ=.50

If T=20, then σ=.31

*OPTPRC of call option expiring*

- immediately after earnings announcement (T=1, σ=.50): $0.52
- in 20 days (T=20, σ=.31): $1.50

# Fix for AIC Numerator

- Using the binomial option pricing model, can derive a direct approximation for E(|ΔP|) for options close to expiration:

$$(P_0 e^{\sigma_0\sqrt{T/365}} - P_0)\Pr(P\uparrow) + (P_0 - P_0 e^{-\sigma_0\sqrt{T/365}})\Pr(P\downarrow)$$

- So E(|ΔP| at EA) =

$$(P_0 e^{E(\sigma_{EA})\sqrt{1/365}} - P_0)\Pr(P\uparrow) + (P_0 - P_0 e^{-E(\sigma_{EA})\sqrt{1/365}})\Pr(P\downarrow)$$

- To simplify, could assume Pr(P ↑)=Pr(P↓)=.5
- How to estimate $E(\sigma_{EA})$?

$$\sigma_0^2 = \frac{\sum_{t=1}^{T} E(\sigma_t^2)}{T} = \frac{E(\sigma_{EA}^2 + \sigma_2^2 + \sigma_3^2 + \cdots + \sigma_T^2)}{T}$$

**Assume**: $E(\sigma_2^2) = E(\sigma_3^2) = \cdots = E(\sigma_T^2) = \sigma_{Normal}^2$

$$\sigma_0^2 = \frac{E(\sigma_{EA}^2) + (T-1)\sigma_{Normal}^2}{T}$$

$$E(\sigma_{EA}^2) = T\sigma_0^2 - (T-1)\sigma_{Normal}^2$$

# STDEV as proxy for E(|FC Error|)

- *Authors*: Good proxy, because Corr(STDEV, |SURPRISE|) = .54
- I agree, as long as the authors want AIC to predict an *empirically measured* ERC.
  - That is, STDEV predicts the SURPRISE that a *researcher* would use in a standard ERC study:

    SURPRISE = IBES actual – IBES consensus forecast
- STDEV does <u>not</u> predict the <u>market's true underlying forecast error</u> related to total earnings news:
  - Corr(STDEV,|Realized Returns|) = -0.04 (significant)
  - Corr(STDEV / P, |Realized Returns|) = 0.03 (significant)
- OK if AIC is meant to predict empirically observed ERCs

# Predicting Empirical ERCs

- **Key trait missing from AIC**
  – 45% of firm-quarter ERCs are negative
  – Why use a predictor that is always positive?
- **More specifics about uses of AIC**
  – Can already compute actual firm-quarter ERCs (Chevis and Sommers 2007)
  – When would we need a predicted firm-quarter ERC instead of the actual?
  – Even if a predicted ERC is needed, is AIC the best predictor?
    - Alternatives
      – The prior firm-quarter ERC
      – A firm ERC estimated from a regression of prior quarters
      – (Last qtr's |ΔP| at EA) / (This qtr's STDEV)

# Other Suggestions

- Make denominator STDEV*$(2/\pi)^{1/2}$
  - This would be **E(|FC Error|) itself**, if analyst forecasts are normally distributed
  - Would ease interpretation of AIC
- Tabulated analyses should use IBES *unadjusted* file
- Do standard errors adjust for lack of independence across observations?
  - There are an average of 2 observations for each *firm-quarter*

# Summary

- Is the paper about
  1. Developing a predicted ERC for research purposes?
  2. Sophistication of the option market?
- If #2, then focus on $E(|\Delta P|)$, not $E(|\Delta P|)$ / STDEV
- If #1, provide more specifics about potential uses
  - AICs do not have key traits of ERCs
    - Numerator is uncorrelated with denominator
    - AICs can never be negative, but almost half of firm-quarter ERCs are negative
  - Is AIC the best predictor of ERCs?

# Thank you!