

Stock Options as Lotteries

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23 March 2012

**Adam Smith Workshop for Asset Pricing and Corporate
Finance—Oxford 2012**

Plan of the Discussion

- ① Short Summary of the results, premises and inferences
- ② Existing evidence on option trading and skewness pricing
- ③ Comments and suggestions

Short Summary of the results...

For stock option markets using returns to maturity:

- ① Expected skewness vs return: **negative** cross-sectional relation
- ② Results **robust** to number of controls, including moneyness
- ③ Results are **strongest for short-term** (one week) options

...premises

- ① Preferences for (total) skewness:
 - Endogenous probabilities model (Brunnermeier et al)
 - Heterogenous skewness preference model (Mitton and Vorkink)
 - Cumulative prospect theory model (Barberis and Huang)

⇒ **positively skewed assets have abnormally low returns**
- ② Options have high variation in skewness that is easily identifiable

...and inferences

Skewness preferences...

- 1 Cause options with **lottery-like characteristics** to be **overvalued** ...**relative** to the underlying assets on which they are written
- 2 May be of the **first-order** importance for pricing options

...and first impressions

- 1 Very intuitive problem formulation
- 2 Nicely executed analysis with lots of controls and robustness checks
- 3 **Do inferences follow from “premises+results”?** Not exactly!
- 4 **The direct result:** Total skewness is priced in options.

Lotteries vs Options: some facts

Options Clearing Corporation data for **equity** derivatives:

- 1 **Annual Turnover / open interest** ratio ≈ 10
- 2 **Trading volume** growth $\approx 15\%$ **per year** in last 15 years
- 3 **Trading volume** $\approx 4.2e9$ contracts or $\approx 20e12$ **USD** in 2011

..and at the same time

Gross gambling revenues in US $\approx 10e10$ **USD**

Questions:

- 1 Why there is such a high turnover in options? Intermediate trading?
- 2 Why would gamblers trade options? It is much easier to bet in

Card Rooms; Commercial Casinos; Charitable Games and Bingo; Legal Bookmaking; Lotteries, and Pari-mutuel...

What do we take home?

Maybe there are some other uses of options that authors ignore

Existing Evidence: Literature and Data II

Options in the portfolio (GE and PE): theory vs. empirical data

- ① Theoretical predictions → options are attractive due to skewed payoffs
- ② Driessen and Maenhout ('07): An Empirical Portfolio Perspective...
 - CRRA, loss- and disappointment-averse agents short puts and straddles
 - Loss aversion and distorted probabilities (CPT) → long puts, but with unreasonably levered equity positions
- ③ Liu and Pan ('03): Dynamic Derivative Strategies
 - Jumps may give long puts along with highly levered equity positions
- ④ Bates ('08), Liu, Pan, Wang ('03): GE analysis with crash aversion, uncertainty aversion toward rare events
 - Agents value skewness, but mostly from insurance, and not lotteries: improve the left tail, and not the right one

What do we take home?

Even pronounced skewness preferences cannot explain the magnitude of option returns, though the skewness-return link is consistently negative

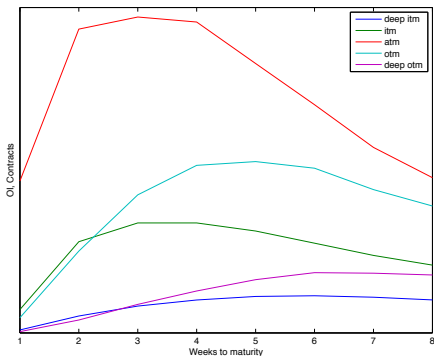
Existing Evidence: Literature and Data III

Options in the portfolio: behavior of the market participants

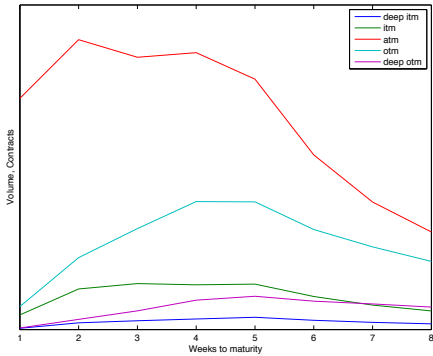
- ① Lakonishok, Lee, Pearson, Poteshman '06: Option Market Activity
 - Written option positions are more common than purchased
 - For both calls and puts nonmarket-makers have more written options
 - (Covered) call writing, few long naked calls, and rarely long naked puts
- ② OptionMetrics Data: open interest and volume by weeks to maturity
 - Deep OTM options (highest skew) are neither much traded nor held
 - Moderately OTM options are traded, but mostly not held to maturity
 - ATM options are the most actively traded, and held to maturity
 - Positions are highest for 3-6 weeks to maturity (not seven days!), then sharply reduced (rollover is common)
 - Combine Table I-B and III-B/C in the manuscript...

Existing Evidence: Literature and Data IV

(a) Open Interest



(b) Volume



What do we take home?

Speculation (gambling) is common, but options are rarely held to maturity;
Skewness from naked contracts is not the primary reason for option trading

Skewness—return relation: implied/ realized/ expected

- 1 Expected **skewness under true measure**: always negative relation → consistent with preference-based theories

Boyer, Mitton, and Vorkink (2010), Amaya and Vasquez (2010), and many others

- 2 Expected **skewness under RN measure**: positive short-term relation, negative or non-significant long-term relation →

consistent with information- and market segmentation theories

Conrad, Dittmar, and Ghysels (2009) using 3-month average implied skewness → negative relation,

Rehman and Vilkov (2008) using current implied skewness → positive relation, Xing, Zhang, Zhao (2009), Bali and

Hovakimian (2009), Cremers and Weinbaum (2010) using a proxy for current implied skewness → positive relation

What do we take home?

Option markets contain short-term information about agents' beliefs, and in the short-run skewness-return relation may be contaminated (reversed).

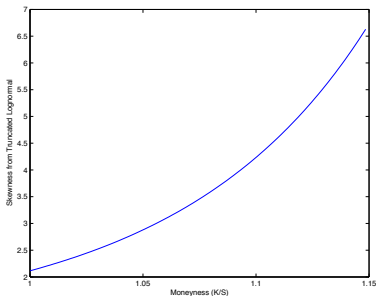
Existing Evidence: Literature and Data VI

Summary of the existing evidence (to be taken care of in the analysis):

- ① Maybe there are some other uses of options that authors ignore
- ② Skewness preferences cannot explain the magnitude of option returns, though the skewness-return link is consistently negative
- ③ Speculation is common, but options are rarely held to maturity
- ④ Skewness from naked contracts is not the primary reason trading
- ⑤ Option markets contain short-term information about agents' beliefs, and in the short-run skewness-return relation may be contaminated (even reversed)

Comments and Suggestions I

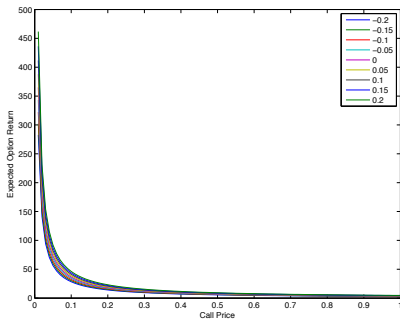
- 1 Preferences for relative skewness in the cross-section or absolute?
 - : skewness-return relation as a plot, full and sub-periods
 - : monotonicity relation—any predictions from theory?
- 2 Skewness vs. moneyness
 - : double sort exercise is not convincing (Conrad, Cooper, Kaul '03)
 - : Fama-MacBeth—collinearity of mnes/skew (corr in the pic 0.97)
 - :



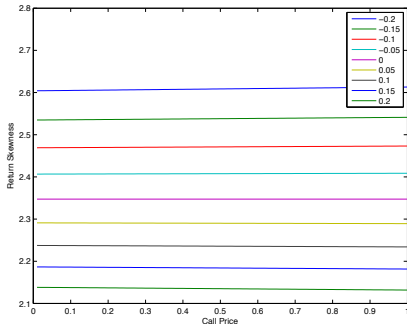
Comments and Suggestions II

- ③ Distributional assumptions and moments of option return
- : the method is very elegant and intuitive, but seems restrictive
 - : what happens if you assume jumps and SV?
 - : skewness depends on moneyness and (a bit) expected stock return
 - : skewness does not depend on expected option return
 - :

(c) ATM Call Return



(d) ATM Call Skewness



Comments and Suggestions III

- ④ Short-term OTM and ITM options (those with extremely high/low skew) are rarely purchased to be held to maturity
 - : use intermediate returns
 - : report the sorting results within moneyness brackets
 - :
- ⑤ Returns: general
 - : holding period returns vs. returns to maturity
 - : outright positions, delta-hedge, structures, short options
 - : magnitude of option returns
 - :

Comments and Suggestions IV

6 Returns: procedures

: Fama-MacBeth: other stock characteristics

size, value as in DiPietro and Vainberg'06, idiosyncratic volatility as in Cao and Han'11

: Fama-MacBeth: include other option-based characteristics

implied-realized volatility spread as in Bali, Hovakimian'09, model-free implied skewness as Rehman and Vilkov '08,

skew as in Xing, Zhang, Zhao '09, tail risk premium, fear index for individual stocks as in Bollerslev, Todorov '11, etc.

: Fama-MacBeth: why using skewness rank and not skewness?

: the cross-sectional variation is not big enough to make a difference?

:

7 Alternative explanations. Factor structure. Spanning

: non-linear factor structure (Dybvig and Ingersoll'82, Jones'06)

: only! one-factor alphas reported: use at least four factors

: correlation factor (DMV'09), skewness factor (Chang et al'09)

: fear factor (Bollerslev, Todorov '11)

:

Comments and Suggestions V

⑧ Past research looking at option returns and characteristics

: Bali and Murray '11: skewness deal from options

explicitly demonstrate that skewness in options has a price consistent with skewness-liking preferences

: Schuerhoff and Ziegler '11: variance risk premium, idiosyncratic and systematic variance

explain the significant returns earned on various option portfolio strategies

: Fias and Santa-Clara '11: optimal option portfolio strategies

show that sometimes it is optimal to be long put options

:

Bottom line

In general a very good paper—enthusiastically recommend for reading

Lots of interesting statistics

Very precise and accurate data handling

Probably answers a question not directly asked in the paper

Probably does not answer the question directly asked in the paper

Good luck in publishing!