Journal of Financial Economics 000 (2018) 1–28

Contents lists available at ScienceDirect

Journal of Financial Economics

journal homepage: www.elsevier.com/locate/jfec

Can financial innovation succeed by catering to behavioral preferences? Evidence from a callable options market☆

Xindan Li[a,b], Avanidhar Subrahmanyam[c], Xuewei Yang[a,b,*]

[a] School of Management and Engineering, Nanjing University, 22 Hankou Road, Nanjing 210093, China
[b] Institute of Financial Innovation, Nanjing University, 22 Hankou Road, Nanjing 210093, China
[c] UCLA Anderson School of Management, 110 Westwood Plaza, Los Angeles, CA 90095-1481, USA

ARTICLE INFO

Article history:
Received 7 April 2016
Revised 27 September 2016
Accepted 9 March 2017
Available online xxx

JEL classification:
D03
D81
G12
G13
G23

Keywords:
Lotteries
Gambling
Financial innovation
Cumulative prospect theory
Callable bull/bear contract (CBBC)

ABSTRACT

We examine the notion that financial products which cater to investors' behavioral biases can yield high trading activity and thus be profitable for issuers. Our setting considers options with a callback feature, namely, callable bull/bear contracts (CBBCs). Such contracts have high skewness when close to callback and thus appeal to cumulative prospect theory preferences. CBBCs with high skewness earn negative average returns, and issuers' gross profits vary positively with CBBC skewness. Over the 2009–2014 period, issuers earn gross profits of about $1.67 billion by trading CBBCs on the Hang Seng Index. These findings highlight the role of behavioral finance in financial innovation.

1. Introduction

In neoclassical finance which is based on rational agents, financial innovations are desirable because they cover additional contingencies (i.e., enable market completeness) or mitigate financial frictions (Ross, 1989; Allen and Gale, 1991; Duffie and Rahi, 1995). However, a large part of the behavioral finance literature focuses on documenting behavioral biases (see, e.g., Tversky and Kahneman, 1990), and it is reasonable to suppose that security

☆ We are grateful to an anonymous referee for insightful and constructive comments. We also thank Abdullah Alshwer, Turan Bali, Naomi Boyd, Ling Dai, Stephen Dimmock, Robin Greenwood, Jean Helwege, David Hirshleifer, L. Jeff Hong, Chuan Yang Hwang, Ivalina Kalcheva, Jun-Koo Kang, Sie Ting Lau, Tao Li, Guangwu Liu, Yanchu Liu, Angie Low, Costanza Meneghetti, Myron Scholes, Chris Schwarz, Devin Shanthikumar, Richard Smith, Zheng Sun, Siew Hong Teoh, Harry Turtle, Shaun Wang, Yan Zeng, Sujiang Zhang, and seminar participants at King Saud University, The Hong Kong Polytechnic University, Sun Yat-Sen University, University of California, Irvine, University of California, Riverside, Nanyang Technological University, University of West Virginia, the 5th Miami Behavioral Finance Conference, the 2014 Annual Meeting of the Academy of Behavioral Finance & Economics, the 2013 Workshop on Quantitative Behavioral Finance, and the 2013 Workshop on Risk Pricing and Related Topics in Financial Engineering for helpful comments and valuable suggestions. We thank Gang Li, Yingjie Li, and Yuzhen Zhou for their help with the data. Xindan Li acknowledges support by National Natural Science Foundation of China (No. 71720107001). Xuewei Yang acknowledges support by National Natural Science Foundation of China (Nos. 71771115 and 71201074). An earlier version of this paper was circulated under the title "Investor Behavior and Financial Innovation: Callable Bull/Bear Contracts". All errors are solely the authors' responsibility.

* Corresponding author at: School of Management and Engineering, Nanjing University,, 22 Hankou Road, Nanjing 210093, China.
E-mail addresses: xwyang@nju.edu.cn, xwyang@aliyun.com (X. Yang).

https://doi.org/10.1016/j.jfineco.2018.01.010
0304-405X/

issuers might be aware of these biases. Motivated by this observation, in a complementary view on financial innovation, we consider the notions that issuers might design and market securities that appeal to investors' behavioral biases, and earn rents from issuing and trading such securities. We consider these perspectives in the context of callable bull/bear contracts (CBBCs) in Hong Kong, which are also known as turbo warrants in Europe.[1] These derivatives are knockout barrier options with a call price and a mandatory call feature. Specifically, a CBBC is called back and trading stops when the price of the underlying asset hits a pre-specified call price. If a callback does not occur, the payoff of a bull/bear contract at maturity is that of a vanilla European call/put option.

CBBCs are actively traded among investors in Europe and Hong Kong. Indeed, in some European countries, turbo warrants account for more than half of total trading in derivatives (Wong and Chan 2008; RCD-HKEx 2009, Section 2). Further, trading in CBBCs accounted for about 10% of total turnover on the Hong Kong Stock Exchange (HKEx) over the 2009–2014 period (with an average annual turnover exceeding HKD 1.4 trillion), up from a 2006 market share of just 0.1%. Moreover, in 2009 there were 8072 newly listed CBBCs, and their market share (10.9%) surpassed that of derivative warrants (10.7%).

The high trading activity in CBBCs is intriguing. Different explanations have been proposed to account for this phenomenon. It has been claimed that some investors prefer CBBCs because they believe that CBBCs are much cheaper than their vanilla counterparts,[2] they are much less sensitive to volatility (Huang 2008, page 10), and because they can closely mimic price changes in the underlying asset (i.e., their absolute delta is close to one), which offers investors higher price transparency (see HKEx 2006, page 1). Josen (2010), however, clarifies that "although the CBBC appears to be cheaper and more transparent than normal warrants ... investors may see their investment suddenly lost if the product is terminated upon the call event."[3] In an article by Lam (2011), Edmond Lee of SG Securities attributes the intense trading in CBBCs to the unpredictability (volatility) of the stock market. Eva Tsoi, a global equity flow strategist at Société Générale, opines in Ngan (2012) that it is the high leverage of CBBCs that attracts investors. In sum, there is no consensus on the appeal of CBBCs.

Here is an hypothetical example illustrating how an investor might profit or lose from trading CBBCs: Assume that the current Hang Seng Index (HSI) level is 20,000. There is a HSI-based, bull CBBC with strike price 19,000, a call level of 19,200, and an entitlement ratio of 10,000. Suppose an investor buys one such CBBC at a price of 0.10 HKD (close to the theoretical value computed from the formula given in Appendix A, discussed later).

(i) If the HSI never drops to the call level at or before maturity, so that the CBBC matures without being called back, and the settlement price for settling a contemporaneously expiring HSI futures contract is 23,000,[4] the investor receives $\max(0, 23{,}000-19{,}000)/10{,}000 = 0.40$ HKD, and the realized return is 300%.

(ii) If on a particular trading day before maturity, say, at 10:31 am, the Hang Seng Index drops to the call level of 19,200, so that the CBBC gets knocked out; and the minimum of Hang Seng Index during the period from 10:31 am to the market closing of that day is 19,100, the investor gets a residual value, which equals $\max(0, 19{,}100-19{,}000)/10{,}000 = 0.01$ HKD, so that the realized return is −90%.

Thus, as can be seen, a CBBC provides the potential of a large realized return if the contract survives knockout, but a virtually complete loss of investment upon knockout. In this paper, we propose that the success of these securities is in large part due to their appeal to cumulative prospect theory (CPT) preferences, which cause agents to invest in such lottery-type investments (Tversky and Kahneman, 1992). We also quantify gross profits accruing to institutions from issuing and trading CBBCs, and show that they are economically substantial.

We first exploit the cross-sectional and time-series properties of CBBCs such as their callback price, how close they are to being called, and their market prices to document that on average, trading activity and open positions are higher in CBBCs with the three characteristics of lottery-type securities proposed by Kumar (2009): low average price, high volatility, and high positive skewness. More specifically, CBBCs close to callback[5] tend to have greater trading activity and more open positions on average; such CBBCs also tend to have low but volatile prices and a positively skewed return distribution.

In the cross-section, we document a negative relationship between skewness (as well as the proximity of the underlying asset's price to the callback level) and average risk-adjusted CBBC returns, which tends to persist even after accounting for price and volatility. This finding is consistent with Barberis and Huang (2008), who argue that securities with high skewness should earn low average returns, since investors with cumulative prospect theory utility are willing to pay price premiums for lottery-type opportunities. We also find that both bull CBBCs (with positive betas) and bear CBBCs (with negative betas) with high skewness earn negative returns, indicating that negative betas are not able to account for our negative returns. Overall, our evidence indicates that high trading activity and open interest in CBBCs, in large part, are influenced by

[1] These contracts can be dated back to late 2001, when they first appeared in Germany.

[2] Since CBBCs are essentially barrier options, their vanilla counterparts are European options and derivative warrants with similar contractual terms.

[3] Similar viewpoints also appear in many CBBC investment guides. HKEx (2006, page 5) clearly notifies the potential investors that "When the underlying asset is trading close to the call price, the price of a CBBC may be quite volatile with wider spreads and uncertain liquidity". See also Barclays (2010, page 16) and Credit Suisse (2014, 2014, item 5.36) is also used by UBS as its FAQs.

[4] In Hong Kong, both HSI futures and CBBCs mature on the penultimate trading day of the relevant expiration month.

[5] Throughout this paper, a contract being close to callback means that the underlying asset's day-end closing price is near (or close to) the call level stated in the contract. Similarly, a contract's "distance to call level" means the distance between the underlying asset's day-end closing price and the contract's call level.

Please cite this article as: X. Li et al., Can financial innovation succeed by catering to behavioral preferences? Evidence from a callable options market, Journal of Financial Economics (2018), https://doi.org/10.1016/j.jfineco.2018.01.010