Journal of Stock & Forex Trading
ISSN: 2168-9458

Polimenis, J Stock Forex Trad 2012, 1:3
DOI: 10.4172/2168-9458.1000e112

Editorial Open Access

Liquidity and Asset Prices

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Abstract

Even though, due to advances in asset pricing theory, we are now endowed with a solid set of theories that allow us to value assets under an increasingly realistic set of assumptions, we still don't have a good understanding of the relation between liquidity and asset prices. This probably has to do with the elusive nature of the concept of liquidity which prevents the emergence of a pragmatic functional relationship with the values of assets. Yet, there are many instances that illiquidity or lack of marketability may play a significant factor in the determination of asset prices. Such issues are for example important in valuing privately held companies, Rule 144 restrictions, or even valuing sovereign assets in financial distress. Here we review some important and recent advances in the area of pricing illiquid or non-marketable assets.

Introduction

During the 20th century asset pricing became one of the most important elements of financial economics. We are now endowed with a solid set of theories that allow us to value assets under an increasingly realistic set of assumptions. Yet we still don't have a good understanding of the relation between liquidity and asset prices. Actually, we don't even have a realistic model that incorporates the most important parameters explaining an asset's marketability or the depth of a market for a particular financial asset. This probably has to do with the elusive nature of the concept of liquidity which prevents the emergence of a pragmatic functional relationship with the values of assets. In this paper, we review some significant and more recent advances in the area of quantifying a discount for lack of marketability (DLOM) and pricing illiquid assets. The proper calculation of a DLOM is still a very difficult art to exercise, since DLOMs as large as 35-40% is usually reported in practice, while some theoretical models predict them to be as low as 10-13.5%. A 20-25% difference in value is a very large number and we need to be able to generate more accurate calculations based on easily observable data. Put otherwise, there is a need for a parsimonious model that, when calibrated to real data, can help explain the size of DLOM in a robust way.

Properly pricing non-marketable or illiquid assets is of extreme importance for many reasons:

- Stocks, bonds and other financial instruments are frequently traded in "thin" markets that exhibit low transactions volume and/or large execution delays. Such illiquid markets "penalize" investors with an adversarial price impact (i.e. higher price buys and lower price sells).
- There are investors who are restricted from selling their shares immediately after an initial public offering (IPO). This happens because underwriters often place such restrictions, so that investors that are allocated early shares do not immediately flip their shares at a profit, thus limiting the upside potential in the fragile post-IPO market.
- Rule 144 originated under the Securities Act of 1933 regulates the sale of so called restricted securities by placing certain restrictions on their sale that are related to
  1. a specified holding period the security holder must have held the security,
  2. sales must comply with certain trading volume limitations.
- Lately it has also become clear that real asset values may be severely impaired due to a sovereign in financial distress. For example, during the 2010-2012 period, as a condition of a European-led bailout, Greece needed to ramp up privatizations. Yet, up to the time of this writing, Greece had failed to live up to commitments to sell off state assets mainly due to extremely low prices that prevailed in the market. One of the significant factors resulting in such low prices is the lack of a healthy liquid market for state assets in financial distress.

Lack of Marketability Models

There is substantial strand of literature that assumes that lack of marketability discounts reflect a resolution of the asymmetric information about firm value [1,2]. More specifically, large private placements are done at substantial discounts to the prevailing market price P_{t-} just prior to the time of the placement. One explanation is based on the fact that such large private transactions are restricted from being resold by Rule 144. Privately placing v shares at a significantly discounted price $P < P_{t-}$ may still be beneficial to the old shareholders, if the placement signals enough undervaluation that results in a large price jump at the announcement thus overcoming some of the under investment [1].

$$vP + \acute{N}P_t > NP_{t-}$$

If N is the total number of shares, and Pt the price right after the private placement announcement, the gain from the information released in the private placement is

$$\Delta NPV_t = N(Pt - Pt-)$$

This gain (after placement costs) is being split among new and old shareholders as figure 1 shows.

In a less than perfect liquidity setting, the first thing to remember is that the true value, V, of an asset may differ from its transactional price, P. Chaffe III [3] asserts that the value of a non-marketable security P is lower than its marketable counterpart V by a discount that equals the

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Received August 15, 2012; **Accepted** August 18, 2012; **Published** August 21, 2012

Citation: Polimenis V (2012) Liquidity and Asset Prices. J Stock Forex Trad 1:e112. doi:10.4172/2168-9458.1000e112

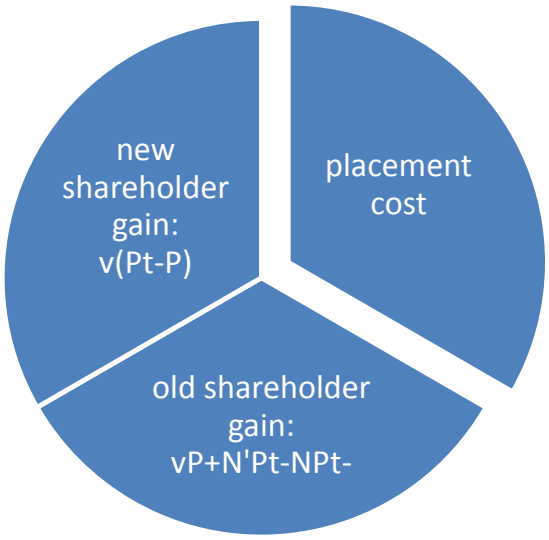

Figure 1: A private placement generates gains ΔNPV by canceling some of the under-investment due to information asymmetry.

price of a put struck at V and expiring at the time the non-marketability horizon lapses.

$$P_t = V_t - p(V, T-t)$$

Since a European option that expires when marketability is resumed represents a lower bound on opportunity cost, that approach is a conservative approach and produces relatively small DLOMs. According to Longstaff [4], marketability is investor specific rather than asset specific, and an investor is not allowed to sell before time T while the true value of a security follows a geometric Brownian motion.

$$dV/V = \mu dt + \sigma dW$$

In that setting, marketability restrictions impose an opportunity cost, since an investor captures only V_T instead of the maximum value $e^{r(T-\tau)}V_\tau$ she would capture if allowed to sell at an intermediate time τ. An investor endowed with perfect market timing ability is then losing.

$$\max_{0\le\tau\le T} e^{r(T-\tau)}V_\tau - V_T$$

Longstaff [4] then uses option techniques in order to quantify this loss due to lack of marketability, but we need to remember that his model produces an upper bound to the proper DLOM since it assumes perfect foresight. A more conservative approach to quantify a DLOM, and one used by many practitioners, is the use of an average-strike put option to capture the DLOM [5].

A Model of Limited Liquidity

The problem with all option-based models is that they assume a liquid and efficient options' market exists, so that we may price non-marketability by using information incorporated in options. By doing so, we are in effect translating a stock pricing problem to a (potentially) more difficult options pricing problem. Such approaches are valid when non-marketability is investor specific and there is a deep and liquid options market. But there are many instances where non-marketability, or rather illiquidity, is asset specific and not investor specific. For example, the appropriate discount when an investor buys a private asset (such as a small private enterprise) or a large stake of a public asset, which may not be easily liquidated without incurring a large price impact.

Similarly in distressed sale situations, there is no absolute lack of marketability (such as the one imposed by Rule 144) but a similar discount effect arises from the fact that during a financial sovereign crisis there is no access to a well functioning stock market. The expectation of a significant possibility that the sovereign may go through a very costly default (combination of a high probability of default and high loss given default) results in thin stock trading and depressed market valuations to unacceptable levels.

In situations such as the ones described above models that assume absolute lack of marketability may not present proper valuation vehicles. Instead, we need models that allow for a positive but limited access to liquidity. In the canonical micro-structure models of Kyle [6] and Glosten and Milgrom [7] liquidity discounts are related to the information released by a large order. In this direction, the tenet that forms the basis of our ability to understand the functioning of order driven markets is that the bid-ask spread is the mechanism which generates returns sufficient to compensate market dealers for the risk of dealing with informed counterparties [8].

In Polimenis [9,10] the focus is in providing a practical model with exogenous liquidity parameters that may realistically be calibrated to real market data. In this model, a limited liquidity supply means that order executions are slow, and a diffusion B_t with drift l, defines the ability of the market to absorb offered shares. A slow sale of a quantity q of an asset would need τ days to complete, with

$$\tau = \min\{t: B_t = q\}.$$

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