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Price discovery and asset pricing

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ABSTRACT

This paper tests the hypothesis that price discovery influences asset pricing. Our innovations are twofold. First, we estimate time-varying price discovery for a large number (21) of Islamic stock portfolios. Second, we test using a predictive regression model whether or not price discovery predicts stock excess returns. We find from both in-sample and out-of-sample tests that all 21 portfolio excess returns are predictable. We show that a mean-variance investor by tracking price discovery is able to devise profitable trading strategies.

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1. Introduction

The lack of research, both theoretical and empirical, on the role of price discovery in shaping asset pricing prompted one of the most pioneering Presidential Addresses by O'Hara (2003). The main message of this Presidential Address was that while the market provides price discovery as one of its two core functions (the other being the provision of liquidity), the role played by price discovery in shaping asset pricing behaviour was less understood. More specifically, O'Hara (2003) notes that: "The risk aspect of price discovery, and its consonant effect on required returns, has not been part of the microstructure calculus. ... price discovery effects affect traders' risks ... and price discovery should affect asset returns". A theoretical model that links price discovery to asset prices therefore paves the way for a test of the hypothesis that price discovery affects asset returns.

In this paper we specifically examine the role played by price discovery in influencing asset pricing behaviour. Our approaches to testing the proposed price discovery–asset pricing hypothesis are twofold. First, we estimate time-varying price discovery. O'Hara (2003: p.1341) notes that: "Markets are complicated; prices are moving and adjusting continuously; and it is the price discovery process that is inherent in the nature of asset pricing". One of the key challenges in understanding the impact of price discovery on asset pricing, therefore, is to have an empirical measure of price discovery over time. To a large extent the lack of methodological approaches to extracting price discovery, particularly time-varying price discovery, has been, in our view, one of the main reasons for the lack of empirical research on this subject. The time-varying price discovery that we extract captures the type of market complications that O'Hara (2003) allude to.

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Our second approach involves an extensive empirical analysis. We focus on Islamic stocks.¹ In order to understand the role of information risk captured in the form of time-varying price discovery, we include only a sub-class of Islamic stocks that have publicly available credit quality information. The motivation for choosing credit quality based stocks has roots in the work of Avramov et al. (2007). Their study uses a sample of NYSE, AMEX, and NASDAQ firms characterised by the Standard & Poor's credit ratings. The key advantage of using credit quality stocks that we have is that it allows us to focus on the process of price discovery for not only credit quality-oriented stocks but also for different classes of credit quality sorted by stock characteristics. Our approach is one that systematically sorts portfolios in terms of stock characteristics such as rating, size, and book-to-market, volatility – (both total and idiosyncratic), asset-price bubble, and trading volume.

All-in-all, we have 188 Islamic stocks belonging to Asia-Pacific markets, for which long time-series data, from January 1980 to December 2014, are available. A long time-series data is imperative for testing time-varying price discovery. Using this stock-level time-series data we form a wide range of portfolios; these includes portfolios characterised by credit quality, size, book-to-market, trading volume, total volatility, idiosyncratic volatility, and asset price bubbles. In all, as a result, we have on hand 21 equal-weighted time-series portfolios. Our methodology (see Section 2) allows us to test for price discovery in all these 21 portfolios simultaneously. We use 20% of the sample as the rolling window and generate time-varying price discovery coefficients for each of the 21 portfolios' asset prices. We then utilize this time-varying price discovery coefficient as a predictor of portfolio excess returns.

These approaches offer two new findings. Our first finding is that in a large portfolio of assets characterised by several stock characteristics, asset price discovery is dominated by size-based portfolios; this portfolio on average accounts for 16.7% of price discovery with the portfolio of the largest sized stocks dominating price discovery (22.4%). Our second finding relates directly to whether or not price discovery contributes to asset pricing—our main hypothesis. We run both in-sample and out-of-sample predictability tests. In-sample tests reveal much stronger evidence of predictability; predictability is found for 20/21 portfolios using in-sample tests while out-of-sample tests only reveal predictability for 10/21 portfolios. For only 10 portfolios there is evidence of both in-sample and out-of-sample predictability. We also test the possible economic relevance/significance of this predictability for those portfolios where price discovery is statistically related to asset pricing. For those portfolios we forecast excess returns using price discovery as a predictor and estimate investor profits using a mean-variance utility function. From this exercise we discover that price discovery not only is statistically meaningful but also economically meaningful in that investors in those 21 portfolios make annualized profits in the 4.90% to 12.33% range if they were to track price discovery in forecasting excess return. The 21-portfolio annualized average profit turns out to be 7.36%.

Our findings contribute to three strands of the literature. Our first finding that price discovery predicts asset price excess returns is to the best of our knowledge the only empirical evidence. This provides direct support to the theoretical model of O'Hara (2003) which sees an explicit role for price discovery in asset pricing behaviour. Second, by discovering price discovery as a predictor of excess return we join a growing list of studies which has used non-traditional predictors to examine their link to asset price behaviour. Among these studies are Rapach et al. (2013), Driesprong et al. (2008), Hsu (2009), and Chava et al. (2015) who show, respectively, that US stock returns, oil price, technology, and credit conditions predict stock returns. Third, ours is the first study that tests for price discovery in Islamic stocks. We therefore join a growing list of studies on Islamic finance which show that Islamic stocks are profitable. The studies that come closest to the proposal of our study are Narayan et al. (2015), Narayan and Bannigidadmath (in press), and Narayan and Phan (2016), who show that the Islamic stock pricing is dictated by credit quality, financial news, and momentum, respectively. We complement these studies by arguing in favour of a price discovery-based story to asset pricing—a story that has theoretical roots in the work of O'Hara (2003).

2. Econometric Method

Consider the time series variables y_t and x_t , observable across $t = 1, \dots, T$ periods. In our case, y_t is excess returns and x_t is a measure of price discovery, whose construction will be discussed later in this section. The question we ask is: can y_t be predicted using x_{t-1} ? The test that we use to answer this question is taken from Westerlund and Narayan (2015), who consider the following model:

$$y_t = \theta + \beta x_{t-1} + \varepsilon_t,$$

$$x_t = \mu(1-\rho) + \rho x_{t-1} + v_t,$$

$$\varepsilon_t = \gamma v_t + u_t.$$

¹ There are not one but multiple reasons why we focus on Islamic stocks. First, Islamic stocks are considered as a new investment class and generally there is lack of literature on Islamic finance. The filtering process adopted by Dow Jones (DJ) screens for Islamic stocks that have compliant core business activities in line with the Shari'a principles and minimum benchmark requirement with respect to financial characteristics. This filtering process enables a refined list of stocks from major equity market indices across several countries suitable for Islamic investments. Studies have only recently taken Islamic finance seriously; culminating into various special issues of journals such as the *Journal of Economic Behavior and Organisation* and *Pacific-Basin Finance Journal*. Second, to the best of our knowledge, nothing on price discovery is known about Islamic finance despite the literatures claim that Islamic finance is a relatively more profitable investment option for investors compared to portfolios of conventional (non-Islamic) stocks; see Narayan and Bannigidadmath (in press). Third, by focusing on the Islamic stock market, we add (from the point of view of asset pricing and price discovery) to the growing body of literature on Islamic finance; see, for instance, Kenourgios et al. (2016), Rahim and Masih (2016), Shamsuddin (2014), and Shaban et al. (2016).

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