The When and Where of Price Formation. Intraday Dynamics in Price Discovery: A Pitch

1.   Introduction

This pitch applies the template developed by Faff (2014) to an academic research topic in the finance discipline. I am currently undertaking a PhD program at the University of Technology Sydney (UTS) and am at the stage where research becomes the major component of my work. In 2013 I completed my honours degree in finance with a thesis based in financial statement analysis and its effects on stock prices. I decided to move into microstructure at the beginning of my PhD. I am still very new to research and enjoy the stimulation that comes with working with and learning from others, something that is not always present in undergraduate. I owe a great deal to my mentor and fellow researchers for their help in both the complicated and simple parts that make up research, including the research itself, as well as the more mundane administrative tasks that are just as important. The idea presented in this pitch paper was on my mind before deciding to do this pitch. I have spent a great deal of time doing background reading, discussing the idea with my mentors, scribbling notes and attempting preliminary proofs.

The process of forming this idea was quite drawn out. At the beginning of my PhD I was unaware of what microstructure was, which required a great deal of reading, even in areas that are not related to microstructure. In reference to Faff (2014), the top of my cocktail glass was exceptionally wide. After this process of reading a wide variety of high quality journal articles and working papers, I settled on the particular area of price discovery, with a focus on different market structures and its effect on related markets. Currently, my main focus includes the doctoral requirements set out by UTS, and I wish to use these requirements to finish the program with both published and high quality publishable papers.

Overall I have found the methodical approach outlined in Faff (2014) to be helpful in condensing the idea into a few simple to understand sections. My mind has a habit of overcomplicating what can evidently be placed into simple categories. I did not complete the template from start to finish, rather I started in the sections I knew, mainly the idea and data, and continued to fill in the other sections. Once this was done I had to revise these two

sections again in order to complete a coherent piece, since I could only clearly see the idea once I had completed the other sections.

The remainder of this letter is as follows: the next section contains a brief commentary on my pitch. Section 3 contains a few key reflections on the exercise itself and section 4 concludes.

2.   Brief Commentary on the Pitch

My completed pitch is displayed in Table 1 with the current working title "The When and Where of Price Formation. The Intraday Dynamics of Price Discovery". The main aim of the paper is to produce a model of time varying price discovery, which is then applied directly in an empirical test. Although I have not yet made any progress on this idea, I have high hopes for the final product, both as part of my PhD thesis, and as a quality publication. The most important papers to this project are Ozturk et al (2014) and Putniņš(2013). Both of these papers are critical as I hope to combine and improve the ideas that are presented. Ozturk et al (2014) provide one interpretation of a time varying price discovery measure based on the original work of Hasbrouck (1995) using flexible Fourier equations and Kalman filter. However, this solution is still fraught with the base measure being influenced largely by factors such as relative noise between compared markets. Putniņš (2013) on the other hand creates a measure based on Hasbrouck (1995) and Gonzalo and Granger (1995) which overcomes the relative dependence of noise of the two measures. The drawback of Putniņš (2013) is that this is still a constant measure which does not take into account the time varying nature of price discovery. The two papers are important because they encompass my problem and most of the associated background, and I will be relying on the ideas presented within them when creating my own work. Furthermore, the work produced by these authors are of high quality, with the authors of the first paper having various top tier publications, and the second being published in a high end journal. The remaining sections in table 1 are self-explanatory, and as such I believe no further comment is needed.

3.   Personal Reflections on the Pitch Exercise

Currently my research career has not included a great deal of "finishing", all my works are still just works in progress, however I can definitely agree that starting has been more difficult than finishing a draft. I am fortunate to have many senior researchers who are willing and able to encourage me to produce ideas, even ideas with no prospects. Although I am still very junior, it feels as though I have sifted through hundreds of ideas, most of which I

later found to have no potential. This pitch exercise has greatly improved the template that I have been using to pitch ideas to my own supervisor, and has definitely shortened and clarified what I would have produced in the past.

At the start of my PhD, I was (and still am) interested in everything. Finance is a very broad field, with many areas left unexplored. I had some difficulty settling on an area of research, especially as I was afraid that something more interesting would come along and cause me to regret a decision that I had become deeply invested in. One thing that I have enjoyed about my PhD is the flexibility to do as much reading I want, and I feel like my base of knowledge is constantly widening, and as such my ideas are constantly becoming more feasible and interesting.

I enjoyed reading Faff (2014) immensely, and am pleased to find that it reflects many of the things that my supervisor has taught me already, especially part B of the template. My ideas in the past have been broad and ambiguous, and on more than one occasion my supervisor has requested me to ask a basic research question. For me the ability to condense an idea that I am not totally sure of into a simple sentence can be a struggle. I enjoy this struggle and therefore enjoy part D, Motivation/Puzzle, as this is the place where I can express and clarify my ambiguity through writing and rewriting this section.

The 2-1 portion of the 3-2-1 template is where I believe I have the most difficulty. I can come up with ideas, and they may be interesting to me, but will they be interesting to others? The issue with research is that there are so many steps to completion, and it's difficult to measure the success of a paper. Is it a success when the idea is greeted with the approval of someone more senior, or is it when it is accepted to a conference, or do you need to win best paper? Perhaps it is only a success when it gets published, or published in a top journal, or perhaps after it brings in a pleasant stream of cites? At this final stage so much time must have been invested and all I can conclude is that you can only ever become increasingly certain that others care about your idea.

Overall though, the publication with many cites starts with a successful pitch of the original idea. I will continue using the pitch template to convince firstly myself, then my supervisor, and then others that what I am doing is interesting and worthwhile.

4.   **Conclusion**

This letter outlines a completed basic pitch template with the idea to create a time varying price discovery measure. This idea is still simply a work in progress, and I welcome any advice, ideas or criticism. The pitch has been developed with the help of Professor

Robert Faff through the use of his paper "Pitching Research" (2014). I will continue to use the skills I have developed through this exercise. I am always improving, and I know that I still have a great distance to travel as I roam in my research journey. It is good to have a place to look for simple advice when trying to keep on track.

References

Gonzalo, Jesus, and Clive Granger, 1995, Estimation of common long-memory components in cointegrated systems, *Journal of Business and Economic Statistics* 13, 27-35.

Hasbrouck, Joel, 1995, One security, many markets: Determining the contributions to price discovery, *The journal of Finance* 50, 1175-1199.

Ozturk, Sait, Michel Van der Wel, and Dick JC Van Dijk, Intraday Price Discovery in Fragmented Markets, No. TI 2014-027/III, Tinbergen Institute Discussion Paper Series, 2014.

Putniņš, Tālis J, 2013, What do price discovery metrics really measure? *Journal of Empirical Finance* 23, 68-83.

Table 1

Pitchers name:	Martin Hauptfleisch	FoR category:	Finance - Microstructure	Date Completed:	6/01/2015
(A) Working Title	The When and Where of Price Formation. The Intraday Dynamics of Price Discovery: A Pitch				
(B) Basic Research Question	Do intraday market frictions cause a change in intraday price discovery?				
(C) Key Paper(s)	Ozturk, Sait, Michel Van der Wel, and Dick JC Van Dijk, Intraday Price Discovery in Fragmented Markets, No. TI 2014-027/III, Tinbergen Institute Discussion Paper Series, 2014. Putniņš, Tālis J, 2013, What do price discovery metrics really measure? *Journal of Empirical Finance* 23, 68-83.				
(D) Motivation/Puzzle Too many words	Market processes such as transitory mispricing, temporary order imbalances, liquidity and other trading frictions have been shown to impact measures of price discovery, however these variables change on an intraday basis. This begs the question of whether there is intraday variation in price discovery, and which variables are the most significant.				
THREE					
(E) Idea	This paper will contain both a theoretical and empirical component. The theoretical part will concentrate on creating a time varying Information Leadership Share measure, which will then be tested on a large data set. My hope is for the created model to produce a varying ILS measure, which will allow us to test the basic research question.				
(F) Data	**(1) Country/Setting:** US stock trading on multiple exchanges, cross border listings can also be used. **Sample Period:** One-second and one-millisecond sampling will be used to account for contemporary market speeds. **Type:** Firm Specific. **(2) Expected sample:** A few firms to begin with, can be easily extended as necessary. **(3) Is it a panel dataset?:** Both panel and time series **(4) Data sources:** SIRCA, TRTH. **Timeframe:** Given database subscriptions and UTS, there should be no major time delay; however creating the method will take some time. **(5) Will there be any problem with missing data/observations?:** Dataset will need to be cleaned in the usual manner, SIRCA and TRTH are commercial and robust datasets. **Database Merge Issues?:** Potential cross listings will need to be mapped. **(6) Will your "test" Variables exhibit adequate ("Meaningful") variation to give good power?** Variation in the price discovery measure should be a function of variation in market noise. **Quality/Reliability of data?:** Should be of high quality due to the commercial sources.				

(G) Tools	SAS, with robust tools for GMM, VECM regressions, other estimation methods and the ability to work with large datasets.
TWO	
(H) What's New?	A new methodology will be produced, which will allow for a robust price discovery metric with intraday variation. This paper will further increase our understanding of the role of different markets in price discovery, including how different markets interact on an intraday basis. Very few studies have looked at intraday variation in price discovery, and fewer still have endeavoured to use an appropriate testing method. Most have simply manipulated a day into slices, creating an estimate of each slice. Liquidity and other market factors have been shown to impact price discovery, yet no known papers test for this on an intraday basis. All of the above combined allow for an improvement in the current price discovery methodologies, and will create opportunities for further study in different markets. The direct application of the methodology onto a large sample will allow for immediate and direct comparison to prior methods and understanding.
(I) So What?	This new methodology will increase our understanding of segmented markets and open up new avenues for future research. Commercial implications of the empirical work will be an outcome of this research, giving exchanges and other markets information which can be used to improve markets overall.
ONE	
(J) Contribution	A new robust methodology that can be used for a new future research direction and a direct application on a large dataset incorporating important markets.
(K) Other Considerations	Is **Collaboration** needed/ desirable? - Methodology: desirable, preferably internal. - Data: no.