Efficiency of IPO Offering Techniques: Semi-theoretical Framework and Empirical Results for US and Chinese New Issues

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Abstract

The efficiency of three major initial offering techniques—book-building, fixed-price, and auctions—are compared across US and Chinese IPOs from 1999 through 2005. Efficiency is measured by first-day returns, gross proceeds, and money left on the table of new issues. A semi-theoretical framework adapts theory from Benveniste & Wilhelm (1997) and incorporates empirical figures from other studies to develop a prediction of average first-day returns for each offering technique. A lengthy data calibration was performed prior to the empirical analysis, seeking to replicate results from Welch & Ritter (2002) on first-day returns, gross proceeds, and money left on table.

1. Introduction

Issuing firms and investors have opposing incentives. It is in an issuer's best interest to use the offering mechanism that produces the greatest proceeds. Investors, on the other hand, desire the greatest return from their allocation in any new issue, and thus seek underpriced offers. Out of these contrasting incentives, three major ways of evaluating an IPO's efficiency can be inferred: gross proceeds, first-day returns, and money left on the table.

Gross proceeds is simply the amount raised from investors, as a function of offer price and number of shares sold. Although the motivation for taking a firm public is not just to raise capital, the maximization of proceeds is certainly a major indicator of the success and efficiency of the offering (Draho, 2004).

The first-day return is a percentage discount from the closing price on the first day of trading to the offer price. Any positive value in this percentage return implies underpricing, and suggests unsatisfied demand at the time of allocation. The question is whether the offer price was set efficiently,[2] that is, whether the firm could have made additional proceeds if the price had been higher. The equally weighted average first-day return of IPOs around the world has been around 16.6%, from an 18-country study (Ritter, 2001). From the investors' perspective, this is the first-day profit margin obtained from having been allocated shares at the offering price.

The amount of money left on the table is the full value of profit received by initial investors. It is the difference between the closing price on the first day of trading and the offer price, multiplied by the number of shares sold. This value represents a wealth transfer from the shareholders of the issuing firm to these investors (Ritter, 2006). A positive value here again questions whether the issuer's proceeds were in fact maximized or whether they could have actually been higher.

Using these three indicators of efficiency, we can empirically examine the efficiency of each of the IPO offering techniques: book-building, fixed-price, and auctions. Specifically, the semi-theoretical framework laid out next shows that book-building should be the most efficient IPO mechanism. It should generate the greatest proceeds as well as the highest first-day returns and money left on the table. Auctions can be up to but no more as efficient as book-building because they lack the under-

[2] The market-clearing, efficient price for a new issue is accepted as the value of the closing price on the first day of trading. (Draho, 2004)

adjusting mechanisms that exist in book-building to thwart collusive or dishonest demand. Finally, fixed price offerings should be the least efficient, evident from their low proceeds and low first-day returns, because there is little flexibility in allocation and prices to fit investor demands.

These efficiency comparisons can be made for new issues in not just the US, where book-building dominates, but also for a country like China, where fixed-price mechanisms used to dominate and are now slowly being challenged by book-building. Although auctions have not occurred on the public Chinese new issues market, there have been increased book-building since 1999. It is worth examining the differences in IPO efficiency across these two countries.

In section 2, some background is given on the fixed-price, book-building, and auction offering techniques. A semi-theoretical framework for pricing is developed for the fixed-price and book-building mechanisms, adapted from theory presented in Benveniste & Wilhelm (1997) along with empirical findings from other studies that could be incorporated numerically into the theoretical parameters. This semi-theoretical framework is the hybrid result of the theory and empirical results, and is able to produce an approximate numerical expectation of the average first-day returns for each of the three offering techniques.

Section 3 describes the initial exercise of data treatment that was undertaken in order to obtain the same values as are accepted in literature for first-day returns, gross proceeds, and money left on the table. This calibration exercise was necessary to best prepare for the main empirical analysis of comparing efficiencies of different offering techniques. The original intention was to replicate and extend data from Welch & Ritter (2002) on initial returns, proceeds, and money left on table for IPOs of 1999 through 2005. However, the discovery of many errors and inconsistencies between databases as well as erroneous and inaccurately documented parts of Welch & Ritter's raw data lead to revision of the exercise. Simply verifying and extending trends in the accepted results would be enough, rather than precise replication of it. The data results presented in this section involve different calibration methods from Welch & Ritter, but are documented with much detail.

Section 4 consists of the methodology and results from empirical investigation of the efficiency of book-building, fixed-price, and auction mechanisms for IPOs in the US and China over the period 1999 through 2005. In particular, the first-day returns found here are compared with the expected values derived in the semi-theoretical framework.

Furthermore, the differences in average gross proceeds and average money left on the table are used to supplement the efficiency comparisons.

Finally, section 5 concludes the paper and provides possible improvements on the data analysis which can be achieved in future studies, as well as one potential area of extension through further research.

2. Semi-theoretical framework and literature review

Research into the initial performance of unseasoned stock offerings dates back to the early 1960s. Many studies have reported positive initial performance of new issues from the offering date until the first date of public market trading (SEC, 1963; Reilly & Hatfield, 1969; McDonald & Fisher, 1972; Logue, 1973; Ibbotson, 1975). Yet there were also few that found initial performance to be negative (Stigler, 1964; Shaw, 1971). One goal of the present study is to examine the overall initial performance of US IPOs. Once that has been accomplished, the second task is to determine and compare initial returns for the three major types of IPO offering methods: book-building, fixed-price, and auction. These three mechanisms are distinguished by their levels of interaction involved with the buy side for determining pricing and allocation of the IPO.

2.1 Fixed-price offerings

The fixed-price mechanism consists of a fixed offer price and non-discriminatory allocation. In the firm-commitment case, shares can be fixed and then acquired by the investment bank from the issuer to be resold to investors. In the best efforts case, the investment bank can have no stake in the offering and set a range of offer sizes for the sale. When oversubscription occurs, allocation is done on a pro rata basis, while undersubscription usually prompts the issuance to be called off entirely. The smaller cost of underwriting and other fees from this mechanism make it more ideal for smaller offerings, in smaller markets. Risk-averse issuers who want more certainty over the issue proceeds will choose the fixed-price offering mechanism (Benveniste and Busaba, 1997). Additionally, it is most privy to information cascades, especially if underpricing occurs early enough to induce investors to buy and propagate a positive impression of the issue (Welch, 1992).

Price-setting in this offering mechanism can be approximated with a model. Start with the concept that retail and institutional investors' standards for investment are different. Institutional investors are endowed with informational advantage, so they will only choose profitable, meaning underpriced, issues to invest in. Retail investors are afraid of the winner's curse phenomenon (Rock, 1986), whereby they are crowded out of underpriced offerings in favor of institutional investors, and given large allocations of

overpriced offerings. So retail investors only want to break even, rather than make a profit.

The following derivation takes a simple mathematical model that incorporates these concepts, from Benveniste & Wilhelm (1997) and adapts it to this study's needs. Let V_{high} and V_{low} be the maximum and minimum in a price range suggested by due diligence and valuation based on firm multiples. Then an investor's expected profit from bidding a price P for an underpriced firm at a demand of Q shares is simply $Q(V_{high}–P)$. Contrarily, the expected loss if shares are overvalued is $Q(P–V_{low})$. Taking into consideration that total demand in the underpriced case means retail investors do not get the full amount they demanded. Their allocation consists of a fractional amount of the institutional investors' demands as well as their own. So, an extra fraction retail component of the entire share amount must be included. Price can then be determined by equating the retail investor's profit (left hand side) to the loss (right hand side) as shown below.[3]

$$Q_{retail}(V_{high} - P)\frac{Q_{retail}}{Q_{retail} + Q_{institution}} = Q_{retail}(P - V_{low}) \quad (1)$$

Note that the fractional demand term is adjoined to the profit (left) side of the equation. The right hand side of the equation remains unadjusted by fractional demand due to the assumption that for overpriced issues—which directly imply loss rather than profit, hence it appears on the right rather than left side—retail investors would get their full demanded. The percentage of total allocation that goes to institutional investors has been shown to be around 70% (Hanley & Wilhelm, 1995) when the offer is priced between the suggested price range. This gives Q_{retail} to be 0.3 if the total demand is scaled to 1. Using this information, the retail investor's break-even condition can be adapted to become:

$$(0.3)Q_{retail}(V_{high} - P) = Q_{retail}(P - V_{low}) \quad (2)$$

Solving for the price at which the fixed-price offering should be set gives the following:

$$P = \frac{(0.3)V_{high} + V_{low}}{1.3} \quad (3)$$

Additionally, it has been shown that the percentage width of price range is on average about 15% of the expected price, or about $1.54 in dollar value (Hanley, 1993).

[3] This is what appears in Benveniste & Wilhelm (1997), which will be adapted in subsequent steps, incorporating other empirical data, to formulate a semi-theoretical prediction of the expected average price at which fixed-price offers should be set. The variable D in their original equation is replaced here with Q.

We can use this information later to compare the expected fixed price to the expected book-built price.

For any given firm, the price determined in equation (3) not only will be the fixed offer price, it should also be the market-clearing, efficient price as defined previously. Denote this efficient price as $V_{fair} = P$. There is no theoretical reason 1why supply and demand would not meet at this point. This leads to the conclusion that for fixed-price offerings, investors' theoretical first-day profits, $Q(V_{fair} – P)$, must be zero. Hence, there should be zero money left on the table, as well as zero first-day returns. We will see how this theory holds up in the empirical analysis.

Some variations of the fixed-price mechanism exist. For example, in China, the vast majority of offerings in the past have been fixed-price, and only since 1999 has book-building begun to be utilized (Howie & Walter, 2003). The current Chinese version of fixed-price issuance involves a book-building sort of approach with institutional investors during the first stage of issuance, then taking the offer price from this process and running a fixed-price offering to retail investors in a second stage of the issuance.[4]

The fixed price mechanism is no longer used as widely in the US, but is still a major method of offering in markets in the UK and Commonwealth countries. Common but on the decline are firm-commitment fixed-price offerings in Asia and Europe, while best efforts offerings are occasionally used in the US and Canada. (Geddes, 2003)

Arguably, prices in the fixed price offers are set lower than the issuer could achieve through book-building, for the tradeoff of having less uncertainty involved when a particular amount of proceeds are guaranteed (Benveniste and Busaba, 1997).

The conclusion here is that we should expect no first-day gain in price from this offering mechanism because any demand changes that can affect price would have taken effect before the equity appears on the aftermarket. According to equation (1), the initial return for each IPO must be weighted by the probability that the order is filled. When demand is high, shares are allocated on a pro-rata basis, while when demand does not clear the market, the entire issuance is cancelled. Evidence in other countries strongly support the zero initial returns prediction, as studies in Singapore by Koh & Walter (1989), Finland by Keloharju (1993), Israel by Amihud, Hauser & Kirsch (2003), and the UK by Levis (1990) have shown.

[4] Verified in correspondence with Carl M. Walter of JP Morgan in Beijing, China.

2.2 Book-building mechanism and the underpricing phenomenon

Book-building is becoming the dominant IPO mechanism worldwide, and is estimated to account for 80% of IPOs outside the US and Canada (Ljungqvist, Jenkinson, Wilhelm, 2003). Book-building allows the investment banker to feel out the demand by taking indications of interest and adjusting price and allocation accordingly. It is characterized by intense marketing and attempts to "build the book" of orders through road shows and client calls. Book-built issues have also been found to be more likely to be followed and positively recommended by the lead underwriters and to receive post-issuance booster shots if needed (Degeorge, Derrien, & Womack, 2004).

Mathematically, the price setting conditions in bookbuilding can be represented in the following way, adapted from Benveniste & Wilhelm (1997). As before, the investor indicates a price P for a firm valued at V. This time, the limiting conditions are determined mainly by the institutional investor, while the retail investor is peripheral to the analysis. Also, we are not concerned with quantity demanded from the institutional investor, but rather the share allocation that the book-runner allots the investor, A. Then the institutional investor's profit is simply A(V-P).

The crux of the pricing problem in book-building is to convince institutional investors to reveal their true demand within their indications of interest. Given a firm value, and the prospect of receiving the same share allocation under honest or dishonest indications, the investor has more incentive to be dishonest, since for any institutional investor,

$$A(V - P_{high}) < A(V - P_{low}) \tag{4}$$

In order for the institutional investor to have incentive to bid high, the expected profit from indicating a high price must be larger than that from making a false value claim. This means that the honest indications must be rewarded with either higher allocations A, or lower offer prices P, for a given value V of the firm. Considering the former possibility in isolation—to reward honest indications with only larger allocations—then the model for any one institutional investor's expected profit must be[5]

$$A_{high}(V_{high} - P_{high}) > A_{low}(V_{high} - P_{low}) \tag{5}$$

In other words, the banker must allocate much fewer shares to the investor who claims a lower price for the offer (left hand side), and more shares to the investor who

[5] This particular equation was taken directly from Benvenist & Wilhelm, (1997).

claims a higher price. Beyond this point, a different issue arises for the banker and issuer's consideration. Knowing that any extra investor profits due to rewarding honesty comes at the expense of the issuing firm, the goal then will be to minimize this cost, while maintaining the same incentive. Keeping the total offering amount the same, issuers can minimize this cost by choosing a final offer price that keeps the $V_{high} - P_{high}$ differential as small as possible, while assigning the individual allocations so that the investor with the highest indication receives as high an allocation as possible, and those with the lowest indication receive as low an allocation as possible. Here, in order to exaggerate the differences in allocation flexibility between fixed-price and book-building, we will denote $A_{high} = 1$ and $A_{low} = 1 - Q_{retail}$.

Now turning the inequality from purely mathematical to include empirical quantities, we use the assumption that institutional investors only buy when they believe the offer is underpriced. Empirical analysis on the median allocation to institutional investors for underpriced sample offering was 73%, leaving 27% for the retail investors (Hanley & Wilhelm, 1995). substitute Q_{retail} with 0.27, as explained in the previous section of fixed-price offerings, We may now update the inequality as:

$$(V_{high} - P_{high}) > 0.73(V_{high} - P_{low}) \quad (6)$$

$$P_{high} < 0.27V_{high} + 0.73P_{low} \quad (7)$$

The investment banker would be forced to set $P_{low} = V_{low}$ in response to indications of such from the investors, because any higher price set in response to the lowest indicative offers possible within the suggested range would cause an inflationary and hence dishonest cascading effect for all other prices within the range. This would lead to institutional investors being unwilling to participate when the true value of the firm was indeed V_{low}. So a substitution of V_{low} for P_{low} is valid here.

Furthermore, as explained above, the issuer and banker want to minimize the cost of eliciting honest information, which necessitates that P_{high} be as close to V_{high} as possible in equation (5) without exceeding it. This makes P_{high} in this inequality precisely the book-building price P_{book} that the book-runner is after. P_{book} will be set as high as possible while still satisfying the above inequality, which effectively means the above relation actually needs to be an equality rather than inequality. Incorporating these substitutions, the final condition for obtaining the book-building price should be:

$$P_{book} = 0.27V_{high} + 0.73V_{low} \quad (8)$$

Given that the company under consideration is the same one as was analyzed in the preceding section on fixed-price offerings, we know from the previous derivations that the market-clearing, efficient price should be P as given by equation (3). From equation (8) above, we know the book-building offering price. By the relation below, we will be able to calculate the theoretical first-day return on book-building offers:

$$\text{Return}_{book} = \frac{P_{book} - P}{P} \tag{9}$$

Next, incorporate an empirical quantity from the previous section. The percentage width of price range is on average about 15% of the expected price, or about $1.54 in dollar value (Hanley, 1993). The spread as defined through example in Hanley (1993) is actually a percentage scaled by the lower boundary of the price range, rather than the ultimate efficient price as was erroneous interpreted in the paper submitted. This means

$$0.15 = \frac{V_{high} - V_{low}}{V_{low}} \tag{10}$$

Furthermore, in book-building, we are comparing the final offer price to the investment banker's estimate of fair price, which before polling potential investors is the midpoint of the suggested price range, i.e.

$$P = \frac{V_{high} + V_{low}}{2} \tag{11}$$

And using the fact that equation (10) rearranged is

$$1.15V_{low} = V_{high} \tag{12}$$

As well as the equation of P_{book} from (8), we can substitute all the above theoretical and empirical information into the calculation for an estimated initial return from book-building, which will be:

$$\text{Return}_{book} = \frac{-0.23(V_{high} - V_{low})}{0.5(V_{high} + V_{low})} = \frac{-0.23(1.15V_{low} - V_{low})}{0.5(1.15V_{low} + V_{low})} = -3.2\% \tag{13}$$

This leads to the conclusion that the reward mechanism for honesty alone is able to induces issuers to leave 3.2% of the profits on the table for investors, in the book-building case. The fact that it is a negative value implies that price is expected to go up once the offer hits the aftermarket. This gives theoretical expectation that book-building will lead to underpricing.

It is important to keep in mind that the semi-theoretical model laid out here gives a fairly low absolute value of the return, lower than we would see in the literature on

book-building (i.e., studies by Aggarwal, Prabhala & Puri, 2002; and Loughran & Ritter, 2002). This makes sense because our model was based off only considering the mechanism of rewarding honest institutional investors with higher allocations. The success of book-building itself derives from other factors, not just though eliciting honest indications of interest, but also because of the intense marketing that drives up perceived values of the issuing firms overall. Furthermore, book-building in many instances in the US, and in China especially, is a self-selecting phenomenon whereby the biggest firms with the highest potential for large and successful IPOs are fought over by investment banks, whereas fixed-price offerings are left for small, no-name firms that the banks do not consider worth their time for doing road-shows and other intense marketing efforts. Lastly, as Ljungqvist & Wilhelm (2002) describe, allocation constraints further necessitate additional underpricing, and that more discretion produces superior outcomes, which points to the optimality of book-building. The multiple layers of underpricing in book-building have not all been enveloped in this one model here, which is why our theoretical first-day return for book-building, taken from the literature, should be accepted to be around 15% (Aggarwal, Prabhala & Puri, 2002; and Loughran & Ritter, 2002)

2.3 Auction offering mechanism

Auctions or tender offers are rare and involve a final offering price set to that which clears the supply at one market-clearing level. Investors either make only one bid at one price, or multiple bids at different prices that create a unique demand curve. Ultimately, those who bid above the clearing price will pay only the clearing price, and receive their full demanded allocations. Those who bid at exactly the clearing price receive a pro rata allocation. See the table below for an illustration of the nuances of this mechanism.

Table 1. Illustration of price clearing and share allocation in auctions

Bid Price ($)	Bid Amount (shares)	Total Demand (shares)	Allocation as % of bid amount	Final offer price ($)
A	a	a	100%	F
B	b	a+b	100%	F
C	c	a+b+c	100%	F
D	d	a+b+c+d	100%	F
E	e	a+b+c+d+e	100%	F
F	**f**	**a+b+c+d+e+f**	**[X-(a+b+c+d+e)]/f**	**F**

G	g	-	0%	-
H	h	-	0%	-
I	i	-	0%	-
J	j	-	0%	-

Proposed offer size = X shares. Here we assume there are 10 bids.

Individual investors' bids are incremental, A>B>C>D>E>F>G>H>I>J, around the suggested price range, where A could be higher than maximum suggested price, and J could be lower than minimum suggested price.

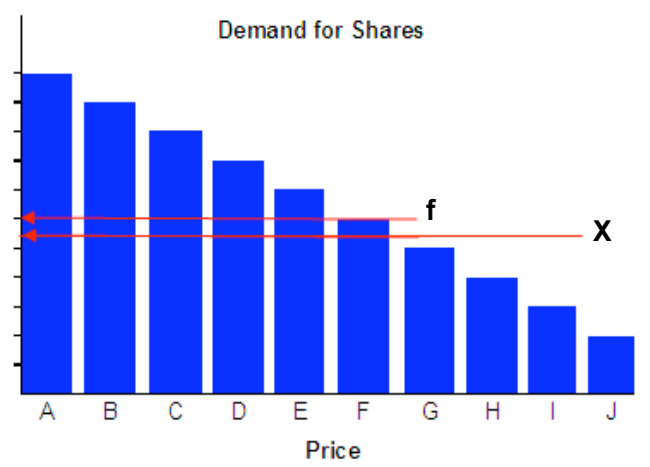

Figure 1. Illustration of step demand schedule and horizontal supply in the auction mechanism, in which the clearing price leaves unsatisfied demand

In general economic theory, auctions are usually the most efficient mechanisms. One would likewise expect them to be the most efficient mechanism in new issues as well, i.e. to maximize proceeds by filling orders at an offer price where supply meets demand, and leaving a negligible amount of residual demand to allow the share price to rise significantly on the first day of trading. Additionally, auctions require less work from the investment banker, and thus should incur lower underwriting fees and related cost. (Draho, 2004).

However, as Figure 1 illustrates, the market clearing price in the auction mechanism is still one that nonetheless gives rise to some amount of unsatisfied demand. This residual demand can cause an uncertain amount of rise in first-day closing price from the offer price, thus creating a positive first-day return. The precise

amount is difficult to judge in a generic framework, but since auctions can be viewed as just restrained versions of book-building, their first-day returns and proceeds should at best be as high as those generated from book-building, but no higher. Auctions, after all, do not incorporate the intense marketing and indication-solicitation services that characterize book-building, and thus make it harder for investors to want to trade up.

There are two additional difficulties of auctions. The first is the inability to reward honest bids, as is possible in the book-building case. The second is the danger of tacit collusion, where investors symmetrically lower their demand, thus pushing the equilibrium offer price far below market-clearing level (Back and Zender, 1993). Under conditions of a flat demand curve and meager investor participation, tacit collusion is a real possibility. The strong reaction of prices to demand can lead to this tacit collusion between bidders, which leads to large underpricing.

To provide one clarification, the underpricing in auctions occurs mainly due to tacit collusion and disincentive for investors to reveal their true demands of prices and quantities. However, there is also a small effect on underpricing from the fractional indivisibility of the bid increments allowed. The fact that bid prices are fractions of a dollar or dollars apart means that over-demand at exactly the clearing price must be dealt with on a pro-rata basis (while all bids above that price are allotted shares fully according to demand). This contributes to unsatisfied demand via a technicality from the auction mechanism itself.

One of the most successful auctions in recent years is that of Google, Inc. Google's auction price range was initially $108 - $135, but was later slashed to $85 - $95. Its final offering price was $85, at the low end of the range, and its first-day closing price was $100. It is unclear whether tacit collusion occurred to some extent, or whether insufficient incentive was given for bidders to reveal honest valuations, which might have caused the offering price to be set near the bottom of the adjusted auction range. On top of that, underpricing still occurred as revealed by the first-day return, an amount comparable to that which would have been expected through book-building.

A study conducted on IPO auctions on an Israeli market in early 1994 —one of the few markets that continue to use auctions for a significant proportion of IPOs—showed that the market-adjusted initial return was 4.5% (Kandel et al, 1999). This is very low compared to the 16.6% world average first-day returns. This implies much lower underpricing in Israeli auction offerings, leaving less money on the table for investors, pointing to generally more price efficiency as defined previously. However,

one must question whether proceeds were in fact maximized without the role of intense marketing, and whether the lower degree of underpricing arose from a more depressed demand that would translate into lower potential proceeds generation.

In an another study however, when first-day returns were compared between auctioned and book-built IPOs on the Japanese market, auctions averaged a one-day gain of 11.4% for 1993 to Sept 1997, while book-building, which took over in the period Sept 1997 to July 2001, averaged a 49.8% return. However, the higher book-building returns were accompanied with seven times higher standard deviation. (Kaneko and Pettway, 2001).

An additional characteristic of auctions that has been observed is that weak demand usually ensues in the aftermarket, which is not auspicious for firms that plan to have future offerings. For example, one of the few investment banks specializing in auction issuances, WR Hambrecht, used its internet "OpenIPO" Dutch auction forum for the IPO of Salon.com, whose proposed sale range was $10.50 to $13.50. Shares eventually were offered at $10.50, and had lost 5% by the closing of the first trading day due to weak aftermarket demand. (Geddes, 2003).

In order for the price discovery process to involve dampened dishonesty and be immune to tacit collusion, some form of underadjustment of prices to the informational content of demand is required. Auctions do not provide this type of damper because they function precisely to find the most efficient equilibrium between supply and demand. That shows the advantage behind the information elicitation aspect of book-building, which is the mechanism able to avoid these problems. (Degeorge, Derrien, & Womack, 2004).

3. Calibration exercise: verification and extension of Welch & Ritter (2002) data

The empirical portion of this study begins with the exercise of obtaining values of first-day returns, gross proceeds, and money left on the table for all new issues in the US from 1999 to 2005. The necessity of this exercise lies in its calibrational importance, since raw data must be manipulated in such a way as to produce results comparable to those presented in the accepted literature on new equity issuances. In particular, it is worthwhile to first learn methods and data treatment skills, such as determining what counts or does not count as an IPO, before undertaking the task of trying to replicate the accepted IPO research.

One of the most suitable articles for this exercise is a review (Welch & Ritter, 2002) of IPO activity, pricing and allocations. It contains a table organized by year from 1980 to 2001 with the three parameters of interest in this study: average first-day returns, aggregate gross proceeds, and aggregate money left on the table. The exercise would consist of verifying this table for an overlapping period and extending it into the current most recent period. Raw data obtained on the SDC Platinum database and calibrated in such a way as to replicate the results of Welch & Ritter would set a standard methodology of data treatment that the author may use for the second portion of this study, whereby efficiency comparisons of different IPO mechanisms can be made.

3.1 Calibration Methods

The SDC Platinum database[6] was used to query new issues of US common stock from January 01, 1999 to December 31, 2005. This time frame was chosen

[6] The main IPO database resource used in this study was SDC Platinum, while Welch and Ritter's study used CRSP-listed closing prices for their stocks and other market data, provided by Thomsen Financial and Dealogic. Working with the available database access at the Fuqua School of Business School's Ford Library was characterized by the fact that IPO queries on CRSP were not possible, and access to Dealogic did not exist, so in order to replicate Welch and Ritter's table exactly, the only option was to order a customized report, which would have diminished the value of this necessary exercise in verification and replication. Most of the initial data discrepancies have now been controlled for to the best of the author's ability, contingent upon the validity of data from SDC Platinum database and knowledge obtained from the author's correspondence. What remains in terms of differences in data results should be inconsequential towards making trend conclusions, and nonetheless provide an equally valid challenge and variation to Ritter's methodology.

precisely to produce a period of three years overlap with Welch & Ritter's data, which was deemed necessary for verification purposes. A list of query conditions and desired output parameters that were input into the SDC Platinum query appears in Appendix A.

From the raw results obtained, IPOs were first arranged by aftermarket exchange on which they traded. Only those listed on the NYSE, Nasdaq, Amex, and small cap markets were retained, eliminating those from Pink Sheet, OTC, any foreign markets, and any that were unlisted. All results were of domestic US firms. Furthermore, the caption on Welch & Ritter's table noted six different categories of IPOs which they had eliminated for best results. These categories of eliminated IPOs involve certain industry types, share types, or characteristics of the issuing firm or issuing price which give way to potentially inaccurate or unreliable data. Correspondence with Ritter regarding these categories of elimination led to deeper understanding of the diversity of issuing firms and the wide range of unique problems they can cause for analysis of issuing activity. The following table lists the six eliminated categories as well as detailed rationale for why those particular types of issuances were eliminated.

Table 2. Categories of IPOs up for elimination and corresponding rationales[7]

Category	Rationale for Elimination
Commercial Banks and S&Ls	The number of shares available for the public is unreliable in IPO data for commercial banks and savings and loan institutions because depositors have first priority at buying shares. Additionally, for demutualizations, the offer price must be approved by government regulators. To avoid unreliable share data which could affect gross proceeds calculations, all IPOs of commercial banks and S&L's were eliminated. Investment banks were not eliminated.
REITs	Real Estate Investment Trusts are not operating companies, but rather go out and buy real estate.
Closed-end funds	Closed-end funds are similar to REITs in that they are not operating companies, but rather merely turn around to buy other financial assets. They are also only "sold, not bought" by stockbrokers to individual investors.

[7] From correspondence with Ritter, these parameters relating to industry type, issuer type, or share type are necessary to shrink the dataset to one that carries the most unbiased information.

Unit Shares	These are a combination of multiple securities, usually common stock and warrants. The deals here are small enough that institutional investors usually do not buy. There are many cases of unreliable numbers, as well as many cases of fraud. These share types were eliminated, and only common shares were retained in the dataset.
Offers below $5	The Penny Stock Reform Act of 1990 imposed severe restrictions on IPOs with offer prices below $5 in an attempt to curb fraudulent security issues (Draho, 2004). For that reason, IPOs with offer prices below $5 are eliminated from this data.
American Depositary Receipts	ADRs are issued by US depositary banks and represent share(s) of foreign stock, corresponding to the foreign stock price adjusted by a foreign exchange ratio and other firm factors. The ADRs trade on U.S. markets, but clearly are not US common stock in the form of stakes in US companies. For that reason, any IPOs that are actually ADRs are also eliminated. [8]

After sorting and eliminating listings according to the above mentioned conditions, a quick, preliminary analysis revealed that IPO counts as well as the values of major indicators of interest were still very far off from those found in Welch and Ritter's table. It was suspected that a difference in database utilization might have something to do with differences in resulting datasets. According to the authors' documentation, much of their data was based off CRSP listings, raising the possibility of differing definitions of "new issues" across databases.

Although it was clear that no IPO search could be done on CRSP without paying for a customized report, it was still necessary to try testing this suspicion in a dexterous way. A query was fed into CRSP with a list of tickers for all companies that purportedly IPOed in 2000, according to SDC Platinum data obtained, searching to obtain CRSP-listed daily stock prices throughout 2000 for these new issue firms. The point was to see if the two databases output consistent information. If the databases were similar, CRSP should output designations of n/a for dates before each firm's IPO issue date, and real stock prices for dates after each issue date.

However, the CRSP output actually displayed real stock price values for a large portion of the firms on every day of the year 2000. From this simple test, it was fair to conclude that either (1) many of these firms had gone through primary issuances already, which is why they already had daily shares prices on CRSP, and hence their appearance in the SDC Platinum data result is seasoned issuance, or (2) these firms are

[8] Definition obtained from SEC documents online.

actually spinoffs from parent firms[9]. The former possibility was eliminated because secondary offerings were documented on the raw query results from SDC Platinum, and few of these issuances were documented as secondary offerings. The latter possibility seemed likely, especially given the possibility that spinoffs and other seasoned issues were eliminated from the standard because the authors believe they have a negative impact on the aftermarket price of parent shares, as the new shares will dilute existing investor interest.

In further correspondence with Ritter, an excerpt of his new issues data for the period November 2000 to June 2001 was obtained, in order to observe line-by-line where the deviations in data could be from. A pattern was observed, whereby the author's "extra" IPOs not matching up in with Ritter's list could be found to be accounted for by the list of "already issued" stock from the CRSP query mentioned earlier. However, Ritter's selected data was not devoid of spinoffs, as revealed in verifications of his IPO data with the author's SDC platinum data, which contained all these necessary parameters.

Furthermore, many errors were found with just that 8-month excerpt from Ritter's IPO list. Despite Welch & Ritter documenting the elimination of unit shares, the excerpt list contained at least one IPO that was labeled as a unit share (Williams Energy Partners), as according to SDC Platinum records. Likewise, at least one American Depositary share was found on his list, labeled in the SDC database as "ADS", or simply "depositary shares" (Alliance Data Systems), despite that it also should have been eliminated. Finally, his list contained several foreign firms (such as CNOOC), some as depositary, and some with physical listings on the American exchanges.

After this line-by-line data checking and the discovery of these incorrigible errors, the original goal of replicating the Welch & Ritter table was abandoned. Instead, a similar but separate calibration standard would be created by the author, since the calibration exercise itself is still necessary. The following table highlights the major parameters that were eliminated or maintained in the eventual study that the author produced, compared to whether those parameters remained or were removed from Welch & Ritter.

Most notable of the differences is that, rather than deciding to maintain or eliminate spinoffs and their effects on the overall average of first-day returns, and overall

[9] The spinoff possibility was actually raised by Connel Fullenkamp, economics professor at Duke University specializing in corporate finance, after the dilemma was discussed in correspondence.

aggregate gross proceeds, and money left on the table, it was decided that separate analyses would be conducted for spinoffs and for unseasoned IPOs. Resulting analyses verified that a split was informative because first-day returns had some large differences. Refer to the data results below. Also worthy of note are elimination of foreign listings (so only domestic listed firms are considered, avoiding having to control for different corporate circumstances and background political issues mixed with the domestic firms listed). Additionally, listings that had no record of closing prices on the first day of trading were eliminated for lack of data purposes. Secondary offerings were also eliminated because they are technically not new issues, and a quick average found that secondary offerings in general have very low first-day return rates, which could cause needless confounding in the data.

Table 3. Comparison of parameters eliminated in present study and Welch & Ritter

Parameters	Status	
	Welch & Ritter	Present study
Firm Types		
Spinoffs	Maintain	Split
Foreign firms listing on US exchange	Maintain	Eliminate
Secondary offerings	Eliminate	Eliminate
Share Types		
ADS	Maintain	Eliminate
Limited Partnership Interest shares	Uncertain	Eliminate
Beneficial Interest shares	Eliminate	Eliminate
A class shares for mutual funds	Maintain	Maintain
B and C class shares for mutual funds	Uncertain	Maintain
Series 1 and series B-1 shares	Uncertain	Maintain
Limited Voting rights shares	Uncertain	Maintain
Trust units and Unit Shares	Eliminate	Eliminate
Primary exchange of listing		
Amex, NYSE, and NASDAQ	Maintain	Maintain
Small Cap Markets	Maintain	Maintain
Pink Sheet, OCT, foreign exchanges, or unlisted	Eliminate	Eliminate
Prices		
Lacking record of first-day closing price	Uncertain	Eliminate
Offer price below $5	Eliminate	Eliminate
Industry Groups		
Commercial Banks, S&Ls	Eliminate	Eliminate
REITs	Eliminate	Eliminate
Closed-end funds	Eliminate	Eliminate

The final steps involved in determining the equally-weighted average values of first-day returns between unseasoned and spin-off IPOs, the aggregate proceeds, and the aggregate money left on the table, for each of the seven years from 1999 to 2005. For first-day returns, volatility was also determined, because it was observed to very consequential in the equal-weighted average.

3.2 Data calibration results

Table 4 below has the results for average first-day returns of all qualifying US IPOs issued from 1999 to 2005, broken down by year and by whether they are unseasoned or spin-off issuances. The average returns and the volatilities of the returns appear as separate graphs in Figures 2 and 3. Average returns are very high for the end of the tech boom years, at 53% for spin-offs and 41% for unseasoned issues, but drop to single-digit values for the majority of 2001 through 2003. Returns for spinoffs have begun to increase again in the last couple of years, although unseasoned returns are staying constant. The spin-off data did not consist of many data points, so their results may not be completely accurate.

Table 4. Average first-day returns and volatility for IPOs in years 1999 to 2005

	First-day return			
	Average (Equal-weighted)		Volatility (Standard Deviation)	
Year	Spin-offs	Unseasoned	Spin-offs	Unseasoned
1999	53.9851%	41.3900%	99.6224%	81.1109%
2000	33.9548%	29.3726%	44.9637%	64.9316%
2001	8.3065%	7.3673%	12.2813%	24.6758%
2002	2.8145%	5.0394%	7.5441%	26.2143%
2003	8.0000%	5.0045%	12.2047%	10.9101%
2004	13.6000%	5.4102%	8.2877%	12.0404%
2005	10.9200%	5.3743%	22.5143%	10.9250%

It was indeed informative to split the IPOs into the two groups, unseasoned and spin-off. When the first-day returns are compared between spin-offs and unseasoned issuances, average returns from spin-off are much almost always higher than returns for unseasoned issues. Additionally, as can be seen in Figure 2, the positive gap between

the two types of issues grows larger as the percentage returns themselves increase, and the gap diminishes or even reverses as the percentage returns themselves decrease. Tentatively, a correlation is suspected between this returns gap and the economic and business cycles. This will be discussed more in the concluding section.

Figure 2 also shows that in the three years of overlap, 1991 through 2001, the general trend in the author's results compared with that of Welch & Ritter's results is very similar. The magnitude of Welch & Ritter's first-day returns in each year is just amplified above the value obtained in the author's results, and increasingly so in years of higher intrinsic market returns. Given all the previously mentioned questionable listings and the difficulties in the replication efforts described earlier, seeing this resulting trend is sufficient to verify that the data has been calibrated well using the standards detailed in Table 3 above.

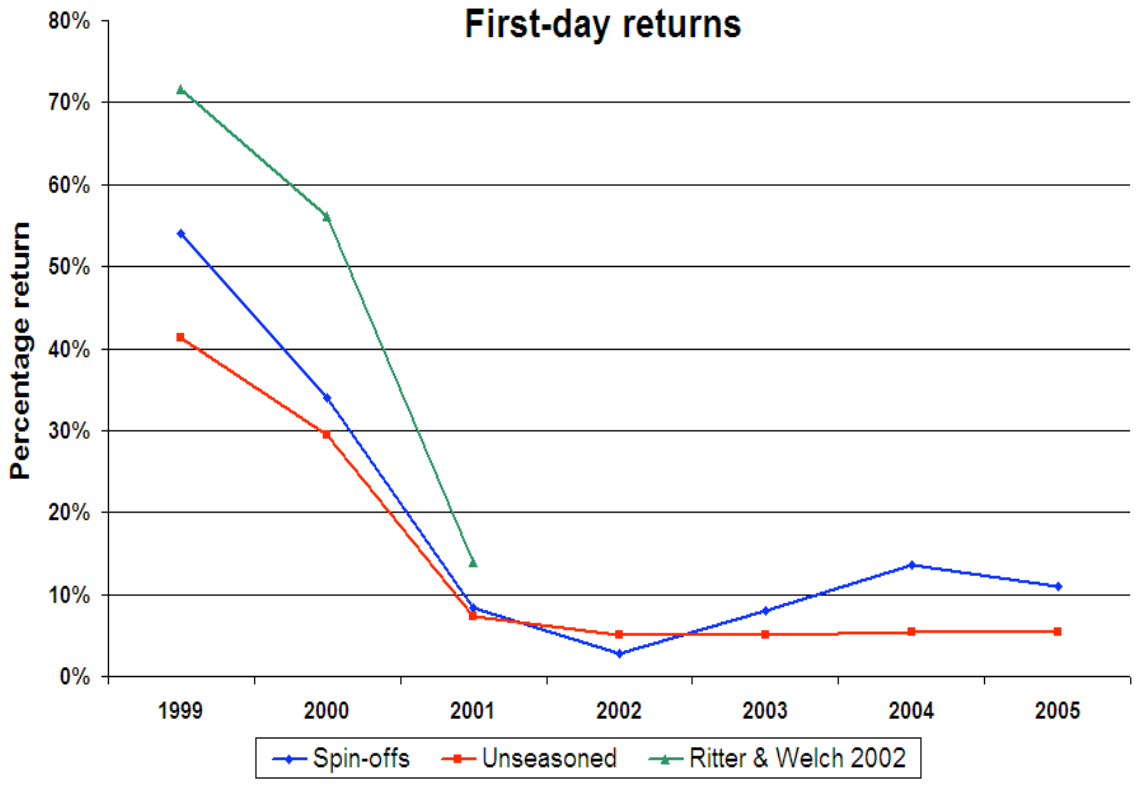

Figure 2. Average first-day returns on US unseasoned offerings and spin-offs, 1999 through 2005, trend comparison with values from Welch & Ritter (2002)

Comparison of Figures 2 and 3 (i.e. comparing the average return to its volatility) reveals that, in years of high average first-day returns, there is accompanying high volatility between individual issuers' returns, represented by a simple measure of standard deviation. In years that returns are low, the individual volatility decreases as well. This parallels the results from the Japanese study mentioned earlier that higher initial returns were accompanied by higher volatility[10] (Kaneko and Pettway, 2001). In other words, years of high initial returns in the primary market must not be simplistically generalized as years with firms having mainly high initial return. Rather, the returns may swing very wildly in both ways.

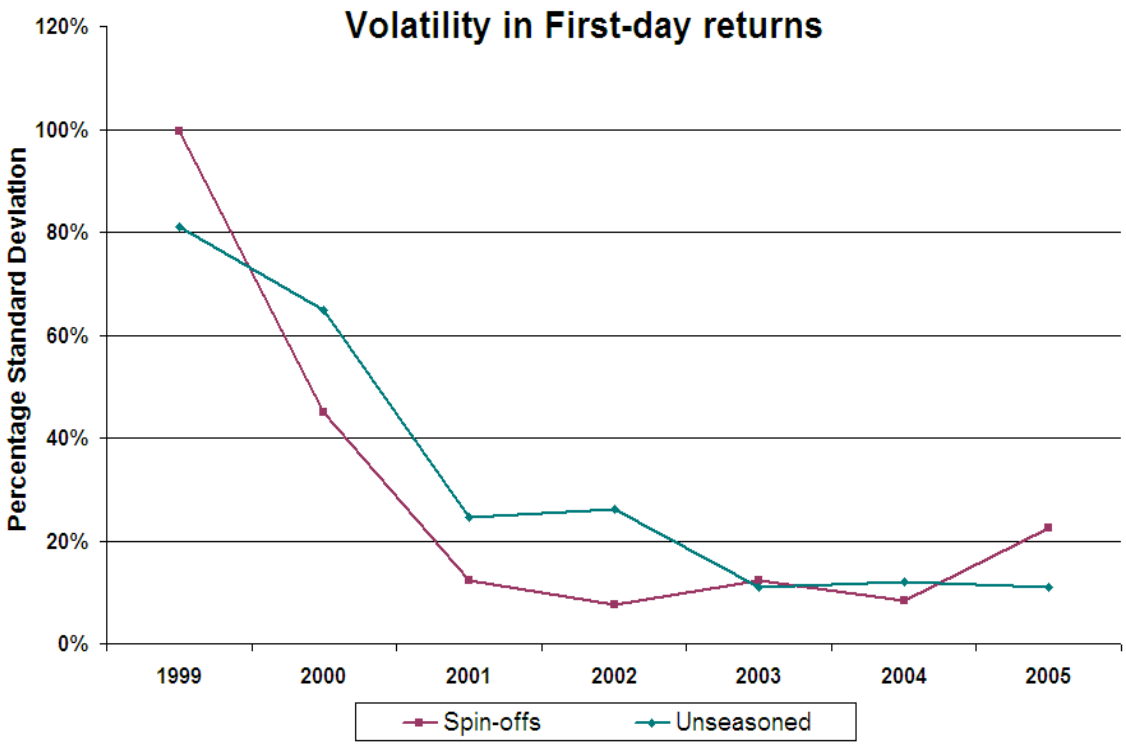

Figure 3. Volatility of first-day returns on US unseasoned offerings and spin-offs 1999 through 2005

[10] Albeit the comparison was between auctioned IPOs (low returns and low volatility) and book-built IPOs (five times higher returns and seven times higher volatility), this study still makes a statement about there being some correlation between return and volatility.

In Table 5, the aggregate gross proceeds and aggregate money left on the table for US domestic new issues are shown for each of the years 1999 through 2005. Here, it does not make sense to split unseasoned from spin-off issues, since the aggregation is needed to compare with Welch and Ritter values, and the aggregation of unseasoned issues will always be higher than spin-off issues merely by sample size. Gross proceeds appeared to more than halve from 1999 to 2003, while money left on the table also decreased dramatically in this period. Both indicators seem to have recovered since the trough in 2003, but are still nowhere near their highs from the end of the last tech boom.

Table 5. Gross Proceeds from issuances aggregated each year, and Money Left on the Table which could have been additional proceeds, aggregated for each year

		Agg. Money Left on Table (bil)	
Year	Agg. Gross Proceeds (bil)	Present study	Welch & Ritter
1999	$120.919	$32.004	$37.943
2000	$109.414	$23.322	$27.682
2001	$82.432	$2.879	$2.973
2002	$66.259	$2.756	
2003	$58.595	$2.539	
2004	$92.044	$4.781	
2005	$87.697	$3.451	
7-year total	$617.360	$71.732	

Although the task of producing a precise replication of Welch & Ritter's table was abandoned after discovering the above mentioned errors and inconsistencies in the databases and in Ritter's own list, it is still worthwhile to compare the end result of IPO monies left on the table with corresponding values in Welch & Ritter. A comparison of these values from 1991 through 2001 shows that this study produced fairly comparable results with those most accepted in the literature. Once again, the magnitude of Welch & Ritter's determination of this wealth transfer from firm to investor in each year is just amplified above the value obtained by the author, and increasingly so in years of higher such intrinsic wealth transfers.

Below in Figure 4 is a graphical depiction of the trends in gross proceeds and money left on the table, scaled on separate primary and secondary axes. The large drop in money left on the table, as well as a drop in gross proceeds can readily been visualized here.

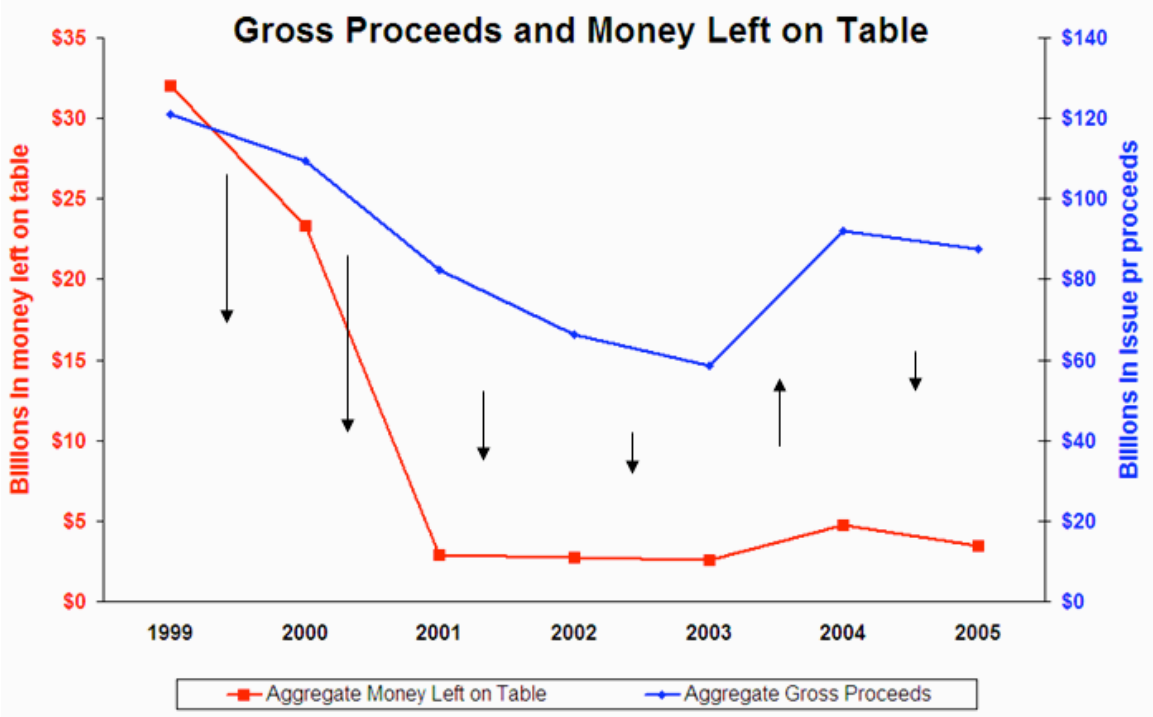

Figure 4. Gross Proceeds and Money Left on the Table aggregated each year

Note also from Figure 4 above that the general trend in gross proceeds and money left on the table is to move up or down together, despite the fact that they should be mathematically complementary according to their simple formulas:

$$\text{Gross Proceeds} = \text{Shares offered} \times \text{Offer price} \quad (12)$$

$$\text{Money Left on Table} = \text{Shares offered} \times (\text{Closing trade price} - \text{Offer price}) \quad (13)$$

This is a curious observation because one would expect their time-series movements to be complementary, as the equations predict. One plausible explanation for this phenomenon is that higher proceeds are a result of demand-side strength. Strong indicative offers or bids result in higher final offer prices as well as sold out allocations, through which large proceeds can be generated. Uncurbed demand continues to support the price as the issue reaches the aftermarket, and leads to strong first-day returns. In other words, what drives an issuance to large proceeds may very well have the momentum to carry it on to equally large first-day increases in price, and therefore returns.

4. Efficiency of offering techniques for new issues in the US and China

At the beginning of the second stage of empirical analysis, IPO data is broken down based on book-building, fixed-price, and auction mechanisms. Preliminary analysis reveals that very few IPOs are auctioned in each year on both the US and Chinese primary markets. Therefore, for this final part of the study, which consists of comparing the efficiency indicators across book-building, fixed price and auction offerings, it does not make sense to do year-by-year comparisons as was done in the calibration exercise. Instead, the resulting list of domestic US new issues and spinoffs for all seven years spanning 1999 to 2005 inclusive are combined and sorted into one of the three types of pricing mechanisms of interest.

Likewise, it no longer makes sense to look at year-by-year values of aggregate gross proceeds and aggregate money left on the table. The total sum of gross proceeds in each of book-building, fixed price, and auction categories must be scaled by the total number of firms issuing in that category, to arrive at a average value of gross proceeds per issuing firm. Similarly, money left on the table is only comparable across the three categories as a mean quantity representing how much the average firm lost out on proceeds as a result of wealth transfer to investors.

New issues data was aggregated and sorted into book-building, fixed-price, and auction types of pricing techniques. Then, the same equal-weighted averaging was done to obtain the average first-day return rate for all three pricing techniques in the US and China. Average gross proceeds per firm and average money left on the table were also determined for each pricing technique in the US and in China.

These empirical results are meant to be compared with the predictions from the semi-theoretical framework outlined in section 2. In particular, we are looking for book-building to generate the highest first-day return, around approximately 15% as in the literature. Book-building should also generate the highest proceeds as well as the highest investors' first-day profit amounts, which are essentially money that the issuers left on the table. Auctions should follow book-building in initial returns and proceeds, as they can be up to as efficient as book-building is, but most likely no more. Fixed-price mechanisms should generate near-zero initial returns, and the lowest gross proceeds as well as money left on the table.

4.1 Chinese new issues treatment

The total number of Chinese new issues from 1999 through 2005 is much lower than number of IPO new issues in the same time period. Furthermore, treatment of the Chinese data does not mirror treatment of the US data. First, the six major parameters that required manual elimination as shown in Table 2 have no consequence in the Chinese data. REITs, closed-end funds, ADRs, unit shares do not exist on the Shanghai or Shenzhen exchanges. A large number of offerings in China have prices below 5 USD as a natural result of the fact that the Chinese exchange rate is largely devalued. Finally, unreliable share data, such as number of actually available to the public, and preferential share allotment are common for the vast majority of Chinese listed firms. Therefore, it is not a unique phenomenon to commercial banks and savings and loan thrifts which would necessitate their elimination.

Furthermore, even most of the additional, independently-derived parameters listed in Table 3 for the calibration of the US data are also mostly irrelevant for the Chinese dataset. Spin-offs are non-existent or perhaps unlabelled in the SDC Platinum records, otherwise the parent of the spin-off is considered the People's Republic of China (governmental ownership). So there is no need for a spinoff/non-spinoff split approach to evaluating the efficiency indicators. Only domestic firms appear on the Shanghai or Shenzhen exchanges[11] insofar as the database records are accurate, so no foreign firms exist to cause confounding in the results. No other shares types exist on the Chinese markets besides A and B shares.[12] Secondary offerings, however, were in fact eliminated from the dataset.

The Chinese data, however, is most likely not as clean as it may appear, just because it does not seem to have too many conditions up for elimination. Rather, there are a lot of potential inaccuracies and omissions in any large sample of Chinese data. It is with this understanding that the author first checked results of the Chinese query prior

[11] Electronic exchanges such as STAQ and OTC trading are also available in China, but the data from SDC Platinum only includes listings on the physical exchanges in Shanghai and Shenzhen.
[12] A shares were originally meant for domestic investors only, while B shares were meant for foreign investors only. B share volume was disturbingly low for the first few years of implementation, and attracted few foreign investors. As a result, reforms have now opened A shares up to both foreign and domestic investors. The data from SDC Platinum inconveniently classifies many listings with general "ordinary/common shares" labels, neglecting to distinguish A shares from B shares in these instances.

to any analysis or treatment of the data was done, using a key piece of knowledge described below.

The first bookbuilding IPO mechanism was used in China in 1999[13] in a secondary offering from Konka Group, a firm specializing in home appliances. Prior to that, IPO pricing was rigidly formulaic[14] and regulated by the CSRC, essentially falling under the category of fixed-price issuances. In a quick check of the validity of pricing technique labeling for all the results returned in the query on Chinese new issues, all IPOs before Konka in 1999 should have been labeled as fixed-price, while Konka itself should be the first instance of book-building to appear. Furthermore, there should be an increase in book-building mechanisms in years after. However, in the query's output file, Konka was labeled as a fixed-price issuance, while the first documentation of book-building did not occur until 2001. Correspondence with SDC Platinum support staff was immediately initiated, and escalated to their data collection team. Resolution regarding the validity of the result of the query is still pending.

Only one instance of auction offering was documented in these records of Chinese new issues, however, it appears to have been a private rather than public offering. The bulk of Chinese issues are fixed-price rather than book-built, even to this day, as was verified in correspondences with Carl Walter at the Beijing branch of JP Morgan Co. Keeping those data limitations in mind, the results are as follows.[15]

4.2 Data Results

The results in Table 6 refer to US primary market data. The US data for the seven-year period consisted of 2933 instances of book-building, 161 observations of

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[13] This is also why in this paper, all data comparisons are made from after 1999 and onwards. It is to ensure that bookbuilding can be a mechanism used at least widely enough in both US and China to be worth of comparison.

[14] The formula is based off an average of the company's last three years of profit and 15 times its P/E ratio, from___, (1998). _____:____, _____. Beijing: _____. This fixed valuation method was applied to all companies, regardless of their differences. The rigidity of the formula was meant to guard against overly-optimistic issuance valuations by investment bankers.

[15] SDC Platinum's Chinese data may not be entirely reliable, as determined through the Konka verification check. As such, the results from this latter section on the comparative study between the US and China may not be entirely conclusive. Currently, the Konka error has been reported and correspondence has been escalated with the data collection team at SDC Platinum, while further robust results for this paper will await the conclusion of the investigation in order to identify any additional errors in the results of the query.

fixed-price offerings, and 14 instances of auctions. Chinese data consisted of 23 observations of book-building, 520 instances of fixed-price offerings, and 1 auction case (albeit private offering).

In general, out of the six results on first-day returns, three for the US and three for China, all but two—book-building and fixed-price offers in the Chinese case—follow the general expectations laid out earlier. These trends are both higher than they should be, but can very well be due to regulatory rigidity that keeps offer prices formulaically low and allows massive speculation to take over in the aftermarkets. The empirical results for book-building found here are 23%, and are around the prediction of 15% and bears some semblance to the trend in literature noted in the semi-theoretical framework.

Auctions' average initial return is also close to that for book-building, but definitely does not exceed it. Curiously, however, average proceeds per firm and average money left on the table per firm are higher for auctions than for book-building. However, that may speak to the size of the offerings rather than the merits or successes of those IPOs, especially because there were very few data points to work with for auctions, usually around 2 or 3 per year. This makes the precision of the auction statistics and the significance of their deviations somewhat uncertain. Fixed-price offering's average initial returns were about 3%, which is more or less as expected, close to the semi-theoretically predicted value of around 0%. The proceeds and money left on the table are lowest for the fixed-price case, as predicted.

Table 6. Average efficiency results for the US

Offering Method	First-day return	Average proceeds per firm ($ mil)	Average money left on the table per firm ($ mil)
Book-building	23.248%	143.273	22.889
Auction	17.969%	149.564	29.349
Fixed-price	3.098%	108.046	12.091

The results in Table 7 refer to Chinese primary market data. Just as in the US case, book-building is the most efficient, generating almost twice as much in average proceeds per firm as in the auction case, and with an average first-day return as high as 31.948%. Compared to the semi-theoretical prediction of 15%, it is apparent that the Chinese experiments in book-building have achieved much higher underpricing. The auction data in the Chinese results, however, cannot be completely trusted because they

refer to a private offering rather than public offering, and there was only this one instance of auction offering in all of the seven years examined. Nonetheless, this one instance of auction offering did appear to generate more average proceeds than fixed-price offers do, and had an average first-day return approaching what would have been the high-end of the semi-theoretical prediction for auction returns on the first day.

The Chinese fixed-price offer group is the main group that does not match the semi-theoretical predictions. First-day return for the fixed-price mechanism is much higher than that of even book-building, at 55.7%. Likewise, fixed-price offers' average money left on the table is also much higher than either auction or book-building. The most likely explanation for this major departure from expectation has to do with the fact that fixed-price offerings were strictly regulated until a few years ago according to a rigid formula as given in a footnote earlier, and may have involved very little effort to meet supply to investor demand. This would explain the low average firm proceeds. The very high initial returns and money left on the table may have more to do with speculation on the primary markets rather than anything else. (Howie & Walter, 2003)

Table 7. Average efficiency results for China

Offering Method	First-day return	Average proceeds per firm ($ mil)	Average money left on the table per firm ($ mil)
Book-building	31.948%	223.018	9.512
Auction	21.709%	125.200	27.166
Fixed	55.757%	76.326	43.278

For very hot IPOs, prices have been found to be revised above their original range, but the number of shares is increased on average 10% (Logue et al, 1999). When the price is revised upwards in its original interval, IPOs have a higher first-day return than those that are revised downwards or stay the same (Hanley, 1993; Ibbotson, Sindelar, Ritter, 1998). In other words, consistent with what relationship we saw earlier between gross proceeds and money left on the table, a demand dynamic that increases the quantity demand before the offer is finalized will also increase demand during the first day of the issuing.

Although many studies suggest that underpricing has more to do with the need for a reward mechanism for investors to bid truthfully, and bankers prefer to reward by

lowering the price on a smaller allocation rather than vice versa (Hanley, 1993), there is also the assertion that investment banks set the offer price of IPOs close to what their fair value would be for a long-term buy and hold investor (Jagganathan & Gao, 2004).

From these results, it seems to be confirmed that bookbuilding is efficient because it allows discretion of the banker to discriminate between investors, which increases the expected proceeds via the process of rewarding investors who report higher values with greater allocations of an underpriced IPO (Biais and Faugeron-Crouzet, 2002). In addition to encouraging price honesty, book-building also discriminatorily allocates shares to investors who are most likely to hold the issue for a long time, who have large demand, and who have good business relations or frequent interaction with the banker.

Book-building also signals quality because an issuer would only choose the more costly route to issuing when they have positive information to convey. Smaller and more risky issuers suffer from the most severe information asymmetries need the marketing-savvy services of investment bankers and the book-building mechanism the most. (Kutsuna & Smith, 2003).

In summary, the results determined empirically show that US and Chinese markets differ tremendously in the level of proceeds produced by issuing firms, and the returns to investors that are in reality a transfer of wealth from the issuers. Although overall levels differ across the two countries, we can substantiate the following rank in efficiency of IPO mechanisms: (1) book-building, (2) auctions, (3) fixed-price offerings.

5. Conclusion

This study empirically examined the efficiency of each of the IPO offering techniques: book-building, fixed-price, and auctions. This was done for new issues in the US and China. A semi-theoretical framework laid out in section 2, containing theoretical parameters partially incorporating empirical findings, showed book-building to be the IPO mechanism with highest first-day returns. This should also mean that the highest wealth transfers from the issuing firm to investors, or money left on the table, happens in the book-building case. Auctions can be up to but no more efficient as book-building because they lack the under-adjustment mechanisms that exist in book-building to thwart collusive or dishonest demand. Finally, fixed price offerings should be the least efficient because they lack adjustment flexibility in price and allocation to fit demands, which should be evident from their low average proceeds and 0% initial returns.

Empirically, book-building dominates new issues in the US, while fixed-price offers dominate in Chinese primary markets. Yet, in both countries, first-day returns are highest for book-building, at around 23% for the US, and 31% for China, where the prediction was 15%. Book-building also claimed the highest gross proceeds in the Chinese case, while in the US case it was a close second behind auctions, which could actually be due to sample size problems. Auction first-day returns were slightly lower than those of book-building in each of the US and Chinese cases, and, as theory predicted, never exceeded those of book-building. Finally, fixed-price offers in the US elicited near-zero average returns, but not so in the Chinese case. Chinese fixed-price offers had high initial returns, but most likely due to both strict regulations on formulaic price-setting, as well as speculation problems involved with an immature market.

Prior to the above empirical analysis, the attempt at verifying and extending the results on first-day returns, gross proceeds, and money left on the table from Welch & Ritter (2002) served as a calibration exercise. However, the discovery of many errors and inconsistencies between databases and parts of Welch & Ritter's raw data lead to revision of the exercise. Using slightly different calibration methods that are well-documented, it was still possible to obtain results close enough to those accepted in the literature and follow general trends. Unfortunately, this calibrational portion of the empirical work turned out to be much more time-consuming than the core analysis itself.

A possible extension of this study that arose from interesting results obtained in the calibration portion of the empirical analysis has to do with the fact that first-day returns for spin-offs are higher than returns for unseasoned issues. This positive gap between them grows larger as the return percentage itself increases, and diminishes or even reverses as the return percentage itself decreases. Tentatively, a correlation is suspected between this returns gap and the economic and business cycles. Further analysis on this phenomenon could be done by regressing market indicators such as the S&P 500 index returns against this difference in returns between spin-offs and new issues.

One possible improvement on this study is to provide more accurate, inflation-adjusted price values to work with. Because the time span is seven years, the calculations of gross proceeds each year were not in real terms. However, a more accurate analysis would include deflators, specifically using 2001 purchasing power using CPI in order to compare and calibrate with Welch and Ritter's work in the calibration section of the study.

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Appendix A

SDC Platinum query contents and important parameters

Deal Type: NI
US domestic common Stock or Chinese domestic common stock

Custom Report Contents:

ORIGDATE
FIRSTRADEDATE
LOCK_DATE
FILED
PAYMENTDATE
SETTLEMENT
TRADE_DATE
LAUNCH_DATE
IPODATE
D
I
BUSS
SICP
ST
TIC
EXCH
IND
G
UNDF
GPCT
UNDPCT
TOTGMIL
AMT
TOTDOLAMT
PROCDS
P
SECUR
DESCR
SH
PRIMSH
SECSH
PCTSAMEDAY
PCT1DAY
PCT1WK
PCT180DAYS
PCT2WK
PCT365DAYS
PCT4WK
PCT60DAYS
PCT90DAYS
PCT1DAYBEF
PR1DAY
PR1DB
PR1WK
PR180DAYS
PR2DAYS
PR2WK
PR2WB
PR365DAYS
PR4WK
PR60DAYS
PR90DAYS
PRSDAY
PRICEOPENSAMEDAY
UOP
UOPMAIN
PROL
R_TOTDOLAMTPRO
AMT
TOTDOLAMT
PRIMSH
TOTPRIMSH
UTOPIA_PRICING_TEC
HNIQUE
PCT_FOR_SALE
DESCR
EXPENSE_FEE_COMM
ENTS
FEE_AMOUNT
FEE_PERCENT
ROA
USPR
OFFERING_TECH
TOTORDSH
ORIGPRICE
PEPF
PE
PBOOK
PBOOKB
EPSPF
EPSYR

EPS
Most Useful Parameters:

Filing Date
Issue Date
Issuer
Business Description
State
Nation
Ticker Symbol
Primary Exchange Where Issuer's Stock Trades
Industry
Proceeds Amount – in this market ($ mil)
Proceeds Amount – sum of all markets ($ mil)
Offer price
Shares Offered – in this market
Primary shares offered – in this market
Secondary shares offered – in this market
Shares offered – sum of all markets
Spinoff's Parent
% owned before spinoff
% owned after spinoff
Spinoff Description
Spin-off Y or N
Spin-off parent ticker
Stock Price 1 Day After Offer
Stock Price at Close of Offer on First Day of Trading
% Change Stock Price 1 Day After Offer
% Change Stock Price at Close of Ofer on First day of Trading
Pricing Technique
Type of Security
Offering Technique
Offering Technique description