A Study of Patterns in the Angel Investing Industry

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I Introduction:

Angel investors are an important source of funding for entrepreneurs that bridge the gap between the so-called friends and family rounds and the venture capital rounds of financing. Angel investors are generally high-net-worth individuals who typically invest in companies at a seed or start-up stage. Given the nature of these investments, failure rates are high, thus giving rise to a higher required return. According to the Centre for Venture Research at the University of New Hampshire, 57,120 entrepreneurial ventures received a total of $26 billion in angel funding in 2007. The Centre of Venture Research also reported that there were 258,200 active individual investors in 2007, a 10.3% increase over the previous year. The Centre of Venture Research also reported that angel investments continue to be a significant contributor to job growth, creating 200,000 new jobs in the United States in 2007, an average of 3.3 jobs per angel investment.

Unlike venture capitalists, angel investors may not be motivated purely by risk-reward considerations. Angel investors may invest in firms for non-economic reasons such as a desire to help entrepreneurs, to become involved in start-ups, to stay abreast with technology, or to build business relationships.

There is a limited body of research on angel investing patterns. The limited data and records kept by angels coupled with the geographically diverse nature of the investing class makes collecting data difficult; nonetheless, I have obtained access to over 18,000 anonymized business proposals submitted by entrepreneurs through Angelsoft, a platform connecting angel investors and venture capitalists to entrepreneurs. I analyze this data to gain insight into the criteria used by angels in evaluating investments.

II Data Description:

The Angelsoft database consists of 18,104 anonymized business plans submitted by entrepreneurs between 2005 and 2008. Of these business plans, 526 ultimately received angel funding. The database classifies business plans by both industry and stage of investment and provides details regarding the number of employees, the date of the business was established, the capital raised prior to submission of the business plan, the monthly burn rate, the pre-money valuation (as estimated by the entrepreneur), and the past experience and education of the founding team. Research on venture and angel screening and evaluation is hampered by limited data resulting in a general inability to draw conclusions. In their overview on angel investing, Michael J. Roberts, Howard H. Stevenson and Kenneth P. Morse (2000) interview 26 angels and review 407 companies funded by angels in their paper on Angel Investing. My research includes a significantly larger database to identify evaluation criteria used by angel investors.

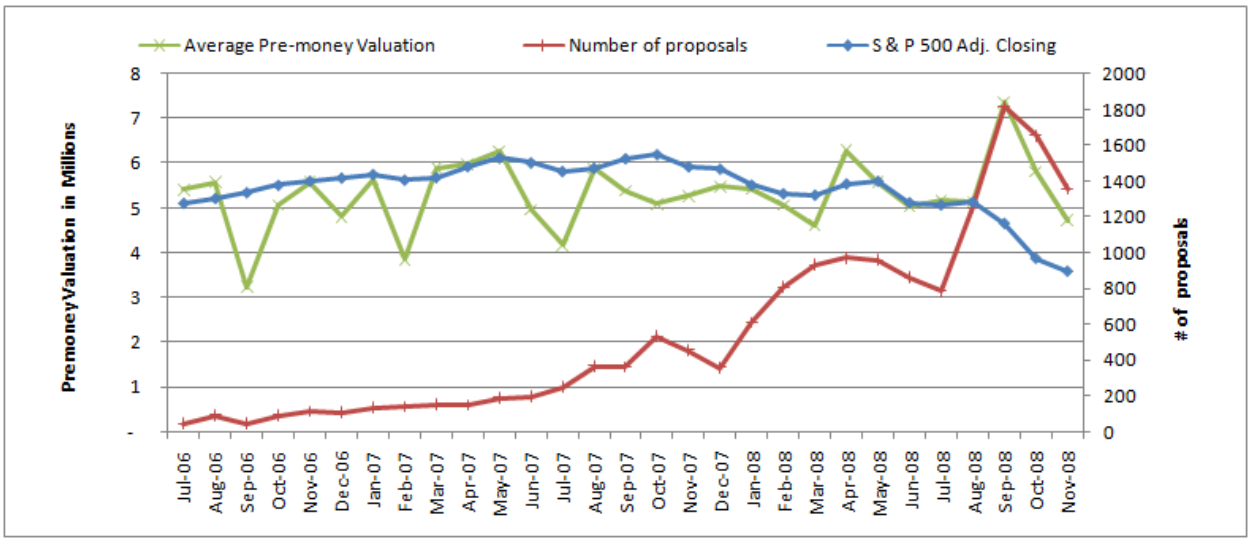
Angelsoft is one of the largest and richest databases of business plans and investments made by angels. The data is based on submissions made by entrepreneurs and contains numerous details and parameters relevant to my study. Business plans are classified into 17 different industries. In Table 1 of the Appendix, I provide an industry-wise break-down of these business plans and distinguish between invested deals and proposals that did not receive investments. I find that while industries such as Software (13.56%), Consumer Product Services (12.77%), Media Entertainment (12.56%) and Business Product Services (9.31%) attracted a higher percentage of business plans, business plans in the Networking Equipment (8.11%), Electronic Instrumentation (5.96%) and Biotechnology (5.19%) industries are significantly more likely than the average to receive funding from angels.

In Table 2 of the appendix, I provide details regarding the monthly burn rate of start-ups, the pre-money valuations expected by entrepreneurs and the capital required by these start-ups (hereafter referred as 'asking capital') by industry for both business plans. In general, firms in the biotech industry have a higher average burn rate, a higher pre-money valuation, and higher asking capital than firms in most other industries.

Start-up entities are categorized as either firms that have developed only a concept (business plan), firms that are in the process of developing the product, firms that have a prototype ready or that have fully developed their product but have not generated revenues, and firms that are currently generating revenues. In Table 3 of the appendix, I provide details of business plans classified by stage of development. Most of the proposals are in their early stages with a completed product and have sales of less than $500,000. Angels show a tendency to fund proposals that have completed prototypes and revenues below $500,000.

In addition to the data above, I have also selected a leading angel group and reviewed all 744 business proposals submitted between August 2005 and October 2008 in order to tabulate the education level, the past entrepreneurial background, the size of the founding team, the references from fellow angels and industry classification. Of these proposals, 696 have complete data.

The following graph compares the average pre-money valuations since July 2006 with the monthly-adjusted closing of S&P 500.



As shown on the graph, the average pre-money valuation remains relatively stable over the period starting July 2006 and ending August 2008. The spike in September 2008 may be due to the increased numbers of business plans during that month. The dramatic fall in both pre- money valuations and number of business plans submitted starting October 2008 may be due to the fall in the S&P 500 starting September 2008.

III Literature Review:

Due to the limited availability of data, few papers examine the patterns of investment among angels and no prior work makes use of a large angel database.

David Kirsch, Brent Goldfarb and Azi Gera (2008) analyze a sample of 722 funding requests submitted to an American venture capital (VC) firm and evaluate the influence of the form of the submission and the content of business planning documents on VC funding decisions. They find that VCs learn critical information through alternative channels and not in fact through business plans, suggesting that business plans do not play an important role in VC opportunity screening.

Michael J Roberts, Howard H. Stevenson and Kenneth P. Morse (2000) provide a broad overview of angel investing. They identify various motivations of angels for investing in companies including a desire to give back to society, to understand start-ups, and to develop networks. Roberts, Stevenson, and Morse also identify sources of deals for angel investors. As outlined in their paper, common screening criteria used by angels in their investment process include screening by industry, by geography, by market size, by the track record of management team and the board, and by referral source. However, the Roberts, Stevenson, and Morse paper does not use statistical methods, analyze the resulting data, or draw any definitive conclusions.

IV Analysis:

Angel investors use various considerations prior to funding business proposals including approaches similar to venture capital firms. Predictably, angel investors prefer to invest in industries that they have some familiarity with or industries that are likely to have a profitable existence in the near future ("hot sectors"). Furthermore, angel investors traditionally favor sectors such as software that are relatively less capital intensive. In addition, entrepreneurs of seed and early stage firms are likely to submit business plans to angels as they have comparatively lower capital requirements and thus have a greater chance of securing angel funding. Presumably, the size of the firm (reflected by the number of employees), the cost of launching the business (reflected by monthly burn rate), the capital needed (reflected by asking capital) and the share of business received by the angel (reflected by pre-money valuation) have a significant influence on angel funding decisions. Accordingly, this paper analyzes whether industry classification, stages of development or burn rates, pre-money valuation, and asking capital affect angel funding decisions.

For this analysis, I am using the sample of 18,104 proposals and estimating a probit model that relates the probability that a business proposal receives funding to a set of dummy variables for the venture's industry, the venture's stage of development as well as logarithmic values of monetary factors like burn rate, pre-money valuation, and asking capital. Using logarithmic values instead of actual numbers reduces the impact of outliers.

I am also including the following stages for business plans in the probit model to allow the estimates to capture the effect of being at various pre-revenue stages of development as opposed to having sales:

1. Concept only
2. Product in development
3. Prototype ready
4. Full product ready

The stage of Positive Revenue is excluded from the model.

Furthermore, I am using the following 16 industries in the model to identify the impact of industry classification on the decisions of angel investors:

1. Biotechnology
2. Business products services
3. Computers peripherals
4. Consumer products services
5. Electronics instrumentation
6. Financial services
7. Healthcare services
8. Industrial energy
9. IT services
10. Media entertainment
11. Medical devices equipment
12. Networking equipment
13. Retailing distribution
14. Semiconductors
15. Software
16. Telecommunications

The lone excluded industry category is “Other”.

The probit results are included in Table 1:

Table 1: Results from probit model using stage of business, industry and other parameters as predictors

Details of Data	
Result	Count
Invested	523
Not Invested	17530
Total	18053
* NOTE * 18053 cases were used	
* NOTE * 51 cases contained missing values	

Probit Data	Coef.	Std. Err.	dF/dx	z	P>|z|
Constant	-2.452	0.233		-10.540	0.000
Deal Characteristics					
ln monthly burn rate	0.024	0.006	0.001	4.160	0.000
ln asking capital	-0.017	0.017	-0.001	-1.010	0.314
ln pre-money valuation	0.036	0.013	0.002	2.690	0.007
Development stage					
Concept only	-0.014	0.103	-0.001	-0.140	0.888
Product in development	-0.061	0.056	-0.004	-1.090	0.276
Prototype ready	-0.061	0.052	-0.004	-1.180	0.238
Full product ready	-0.333	0.058	-0.017	-5.740	0.000
Industry					
Biotechnology	0.367	0.098	0.031	3.750	0.000
Business products services	0.171	0.084	0.012	2.040	0.042
Computers peripherals	0.161	0.189	0.011	0.850	0.396
Consumer products services	0.090	0.080	0.006	0.080	0.259
Electronics instrumentation	0.432	0.126	0.039	3.430	3.430
Financial services	0.139	0.123	0.010	1.130	0.257
Healthcare services	0.015	0.121	0.001	0.120	0.902
Industrial energy	0.140	0.101	0.010	1.380	0.168
IT services	-0.011	0.118	-0.001	-0.100	0.924
Media entertainment	0.069	0.081	0.004	0.860	0.391
Medical devices equipment	0.208	0.094	0.015	2.220	0.026
Networking equipment	0.582	0.184	0.026	3.160	0.002
Retailing distribution	0.036	0.125	0.002	0.290	0.774
Semiconductors	0.241	0.271	0.018	0.890	0.374
Software	0.196	0.075	0.014	2.620	0.009
Telecommunications	0.208	0.121	0.015	1.730	0.084

Based on results from the model, the stage of development has a limited impact on the probability of angel funding; however, businesses that have a fully developed product but no revenues are at a significant disadvantage in obtaining funding from angel investors. This result suggests that angels are skeptical of firms that are unable to generate revenues despite having a fully functional product. The model also suggests that pre-money valuations and asking capital do not have a statistically significant impact on angel investors' decision-making process. However, the model does suggest that monthly burn-rates have a positive statistical impact in determining the projects that angels select, a conclusion reinforced by my conversation with a leading angel investor where he directly indicated that angel investors prefer projects with low burn rates. Burn-rates may also be a proxy for the firm's stage of investment. Angel investors have shown a preference for projects in later stages of development (revenue generating projects). These projects tend to have a lower level of uncertainty but may have higher burn rates. Angel investors who seek less uncertain projects with high burn rates may be at risk of discovering that these ventures run out of cash sooner, and thus require subsequent rounds of funding. This result is consistent with the general understanding of behavior of angel investing.

Through my research, I find that industries such as biotechnology, electronic instrumentation, and networking equipment are more than twice as likely to obtain angel funding when compared to other industries. This result suggests that angels consider industry type as an important evaluation criterion.

In-depth Analysis:

Angelsoft has a record of all business proposals submitted since August 2005 and I reviewed all business proposals submitted to a leading angel group until October 2008. In all, there were 696 proposals with complete data of which 51 proposals were successful and 645 proposals were unsuccessful in securing angel investments.

Roberts, Stevenson, and Morse (2000) suggest that the track record of the management team and the referral source are important factors considered by angels. Thus, I review the business plans to collect details of the entrepreneur's background and past entrepreneurial experience as proxies for management's record of accomplishment. I also tabulate the source of referral of business plans since the referral process serves as a background check and validation from a trusted source. Educational background is classified as either "no background" (if not mentioned in the plan), under-graduate, or graduate education. Similarly, business plans are classified based on the size of the entrepreneurial team, using "sole entrepreneur", "small teams" or "full boards" to differentiate the plans. A small team is composed of 2-3 professionals while a full board includes 5-6 professionals with functional expertise. The source of the referral is categorized as either "referred by members" or "not referred by members".

Finally, I tabulated the industry variable to determine if the nature of the industry is a significant factor in the selection process. Certain industries such healthcare, internet, mobile services, retailing and telecommunications were not considered due to the lack of business plans with successful funding. Therefore, the sample size for the regression is 644 plans.

A probit analysis identifies whether these factors are a significant factor in angel investors' decisions. This test is designed to identify parameters in the entrepreneurial team and

industries considered important by angel investors. The results of the probit model are outlined below:

Table 2: Probit model using education, past entrepreneurial background, size of team referral and industry as predictors

Details of Data	
Result	Count
Invested	51
Not Invested	593
Total	644
* NOTE * 696 cases were used	
* NOTE * 52 cases were not considers as they belonged to industries that did not receive funding	

Probit Data	Coef.	Std. Err.	dF/dx	z	P>|z|
Constant	-2.501	0.394	-	-6.370	0.000
Founding team characteristics					
Graduate Education	0.105	0.209	0.012	0.500	0.614
Size of team, Full board (with specialist)	0.324	0.210	0.432	1.540	0.123
Referred by fellow angel	0.628	0.167	0.089	3.750	0.000
Past Entrepreneurial experience	0.404	0.166	0.050	2.430	0.015
Industry					
Biotechnology	0.975	0.597	0.205	1.630	0.103
Business products services	0.340	0.421	0.041	0.810	0.419
Computers peripherals	1.027	0.569	0.221	1.800	0.071
Consumer products services	0.578	0.463	0.091	1.250	0.212
Electronics instrumentation	0.997	0.565	0.213	1.760	0.078
Financial services	1.094	0.545	0.244	2.010	0.045
Industrial energy	1.007	0.738	0.218	1.370	0.172
Marketing	1.030	0.585	0.223	1.760	0.078
Media entertainment	0.688	0.424	0.105	1.620	0.105
Medical devices equipment	0.431	0.637	0.065	0.670	0.505
Networking equipment	2.744	0.824	0.817	3.330	0.001
Software	0.984	0.436	0.192	2.260	0.024

The average business plan has a 7.9% (51/ 644) chance of obtaining angel funding. Business plans referred by fellow angels have an 8.9 percentage point higher chance of being funded by angel investors, holding all other factors constant. Therefore, firms referred by fellow angels are twice as likely to obtain funding. On the other hand, possessing a graduate level education and large team size (reflected by "full board") does not make a significant difference in the success rates of obtaining funding. Past entrepreneurial background substantially improves the chance of angel funding, albeit with a slightly lower statistical confidence. Industries such as biotechnology and networking equipment have a significantly higher probability of obtain angel funding from this group.

Angel investors are unconcerned with the size of the entrepreneurial team or the team's education because they may not perceive these parameters to be important factors in determining the success of the business. On the other hand, past entrepreneurial background and validation from fellow angels serve as a proxy to validate the entrepreneur's record of accomplishment as well as the integrity of the entrepreneur and as a result, angels emphasize these factors. The data therefore suggests that angels adopt a pragmatic approach in selecting factors for making investment decisions.

Conclusions:

In this paper, I evaluate the impact of monetary factors comprising burn rates, asking capital and pre-money valuation along with non-monetary factors comprising the stage of development of venture and industry type in a sample of 18,104 business proposals. My findings indicate that ventures with higher burns rates and ventures in biotechnology, electronic

instrumentation, and networking equipment have a significantly higher probability of obtaining angel funding. Similarly, ventures with fully developed products and no revenues have a significantly lower probability of obtaining angel funding. This result suggests that angels prefer projects that generate revenues and are in later stages of development (reflected by higher burn rates).

I also evaluate all deals placed before a leading angel group to analyze the impact of education, size of founding team, past entrepreneurial experience and source of reference of the proposal on the probability of funding. I conclude that having a past entrepreneurial background, a reference check from a fellow angel, and a specific industry classification significantly improves the chances of obtaining angel funding. These results support the intuitive conclusion that angels select ventures that have proven entrepreneurial track records and have validation by a trusted source.

Appendix

Deal flow and investing patterns:

Table 1: Industry-wide distribution of business proposals and investments

Industry	Not Invested	Invested	Total	Industry-wise Distribution	Percentage Success
BIOTECHNOLOGY	676	37	713	3.94%	5.19%
BUSINESS PRODUCTS SERVICES	1635	51	1,686	9.31%	3.02%
COMPUTERS PERIPHERALS	187	6	193	1.07%	3.11%
CONSUMER PRODUCTS SERVICES	2253	59	2,312	12.77%	2.55%
ELECTRONICS INSTRUMENTATION	300	19	319	1.76%	5.96%
FINANCIAL SERVICES	533	16	549	3.03%	2.91%
HEALTHCARE SERVICES	658	15	673	3.72%	2.23%
INDUSTRIAL ENERGY	878	27	905	5.00%	2.98%
IT SERVICES	785	16	801	4.42%	2.00%
MEDIA ENTERTAINMENT	2219	54	2,273	12.56%	2.38%
MEDICAL DEVICES EQUIPMENT	986	39	1,025	5.66%	3.80%
NETWORKING EQUIPMENT	102	9	111	0.61%	8.11%
OTHER	2796	56	2,852	15.75%	1.96%
RETAILING DISTRIBUTION	661	14	675	3.73%	2.07%
SEMICONDUCTORS	71	3	74	0.41%	4.05%
SOFTWARE	2368	87	2,455	13.56%	3.54%
TELECOMMUNICATIONS	470	18	488	2.70%	3.69%
Grand Total	**17578**	**526**	**18,104**	**100.00%**	**2.91%**

Table 2: Industry-wise details of key parameters for all business proposal

Industry	Average # of employees	Average monthly burn rate	Average pre-money valuation	Average asking capital
BIOTECHNOLOGY	7.73	63,395	10,976,667	2,611,456
BUSINESS PRODUCTS SERVICES	7.30	33,065	6,864,924	2,296,627
COMPUTERS PERIPHERALS	9.82	26,204	10,545,802	2,390,630
CONSUMER PRODUCTS SERVICES	5.99	27,193	7,139,655	1,278,251
ELECTRONICS INSTRUMENTATION	6.65	40,275	5,741,419	1,521,904
FINANCIAL SERVICES	7.59	39,995	6,282,119	6,078,536
HEALTHCARE SERVICES	8.51	37,284	6,260,259	1,509,958
INDUSTRIAL ENERGY	7.44	38,992	16,224,965	3,055,674
IT SERVICES	6.80	24,651	6,677,869	2,560,263
MEDIA ENTERTAINMENT	7.00	34,956	8,613,745	2,088,552
MEDICAL DEVICES EQUIPMENT	6.78	50,129	8,579,632	1,704,467
NETWORKING EQUIPMENT	9.25	40,988	10,403,832	1,966,793
OTHER	6.44	28,681	11,568,142	2,775,914
RETAILING DISTRIBUTION	8.48	23,322	3,833,870	2,707,158
SEMICONDUCTORS	9.62	63,833	5,350,086	1,335,809
SOFTWARE	6.92	34,487	5,433,875	1,198,356
TELECOMMUNICATIONS	7.78	44,397	6,464,625	4,364,659
Grand Total	**7.03**	**34,677**	**8,256,074**	**2,233,397**

Table 3: Stage-wise details of key parameters for all business proposals

Deal Stage	# of deals	Average # of employees	Average monthly burn-rate	Average pre-money valuation	Average asking capital
CONCEPT ONLY	759	6.38	22,973.92	7,031,881.72	3,464,062.79
PRODUCT IN DEVELOPMENT	3322	4.80	30,881.38	11,237,148.04	2,707,304.68
PROTOTYPE READY	3642	5.00	31,387.67	8,882,432.48	1,816,268.91
FULL PRODUCT READY	4259	6.24	31,281.96	8,204,397.08	2,537,322.43
Revenue less than 500K	4244	6.25	34,595.99	5,163,125.18	1,614,827.52
Revenue from 500K to 1M	823	9.48	43,351.97	8,800,989.00	1,914,824.36
Revenue from 1M to 3M	724	18.62	62,841.36	9,090,598.70	2,532,113.65
Revenue from 3M to 5M	168	26.95	96,324.04	10,349,791.38	2,513,201.96
Revenue from 5M to 10M	113	40.69	97,671.90	9,330,742.12	3,496,663.35
Revenue from 10M to 20M	32	108.16	93,664.88	19,636,386.13	4,349,361.19
Revenue from 20M to 50M	13	76.77	83,539.38	23,649,534.00	6,128,846.15
Revenue greater than 50M	5	52.80	183,111.00	8,511,111.00	18,111,111.60
Grand Total	18104	7.03	34,676.77	8,256,073.99	2,233,397.43

Acknowledgement

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