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FINANCIAL PERFORMANCE ANALYSIS SURROUNDING INDONESIAN INITIAL PUBLIC OFFERINGS

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Abstract
One of the ways to find out the performance of company making Initial Public Offering (IPO) is through the financial performance analysis. The analysis would help investors prior to deciding to buy the stocks of the company. Financial ratios are a common tool used in making financial statement analysis. This study aims to analyze whether the companies' financial performance improves after the IPO. This research is quantitative research using secondary data. The sample consists of 59 companies' making IPOs on the Indonesia Stock Exchange from 2010 to 2014. Results indicate that only Current Ratio increases significantly over three years after the IPO. The other ratios, i.e., Debt to Asset Ratio, Debt to Equity Ratio, Total Asset Turnover, Net Profit Margin and Return on Equity decrease. Overall, the financial performance of the companies tends to worsen, except for liquidity ratio.

Introduction
Initial public offering (IPO) of common stocks is one way of funding sources for the company. The company intended to conduct an IPO is required to issue a prospectus. The prospectus contains various information about the company, one of them is the financial reports (Marcus et al., 2008). The function of the prospectus is to assist investors in making informed investment decisions by providing relevant information. It cannot be denied that investors use financial information as one of the means to analyze the company. Practitioners use earnings estimates for corporate performance appraisal purposes (Kim and Ritter, 1999). One of the information in the prospectus is the financial statements. Company financial information is used by investors to analyze financial performance and predict future financial condition as a consideration to investment. Nevertheless, investors should carefully assess the company's financial performance, some studies have found that earnings management practices are found in IPO cases, such as Friedland (1994), Teoh et al. (1998), or Saiful (2004). One way to know whether a company performance is good or not after conducting an IPO is through a financial performance analysis by comparing the company's financial performance over time or with similar companies.

Several studies have been conducted to analyze the financial performance before and after the IPO. The results of the studies do not seem always to show a similarity, where the financial performance of the company is not always better after the IPO. Jain and Kini (1994) find that return on assets, operating cash flow over total assets, and asset turnover decrease over three years after the IPO. Sales growth and capital expenditure do not significantly change. Other studies tend to show relatively unequal results. For example, Chi and Padgett (2006) show earning per share, return on equity and return on asset, sales growth rate, and asset efficiency, and leverage (debt to assets ratio) decrease among Chinese IPOs. Pastusiak et al. (2016) find the return on equity and return on asset decrease after IPO, but operating profit margin and net profit margin go up in the IPO in Poland.

From several previous studies, results of analysis on the financial performance of companies before and after conducting an IPO still show inconsistency. The differences may be as a result of differences regarding capital market policy in a country, sample size, objects, period of research or the financial ratios being used. Motivating by these differences and using more recent data, this study aims to analyze the differences in financial performance before and after the IPO in Indonesian capital market. The study uses one liquidity ratio, two debt ratios, one activity ratio, and two profitability ratios. Our study excludes companies that make IPO from January to April as their latest full financial reports available in the prospectus are not in one year before the year of IPO, but two years before the IPO year. This is different compared to many previous studies using Indonesian IPOs as they do not consider this issue. Overall, the findings show that the liquidity ratio tends to improve, debt ratios are improving, activity ratio tends to go down, and profitability ratios tend to decrease.

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Review Literature

Research on financial performance around IPO can be traced back to a study by Jain and Kini (1994). They analyze the operating performance of the IPOs within 13 years from 1976-1988 on the New York Stock Exchange. Jain and Kini find that return on assets, operating cash flow deflated by total asset, and asset turnover is decreasing after the IPO. While, growth sales and capital expenditure are not found to change significantly. They conclude that management's efforts to make financial performance attractive before the IPO left the company unable to maintain its post-IPO performance.

Since the publication of Jain and Kini (1994), some studies have been conducted to test changes in financial performance in the period after the IPO. For example, Mikkelson et al. (1997) examine 283 IPO companies in the United States during the 1980-1983 period. They find that operating performances tend to decline after IPOs. Alanazi and Liu (2013) investigate the financial and operating performance of 52 IPO firms in the GCC region from 2003 to 2010 and report that the debt to assets ratio increases after the IPO, while the net profit margin and total assets turnover decrease. Other studies have also been conducted in developing countries, for example, Ahmad (2011) analyzes the operating performance of 192 companies in Malaysia in 2000-2005 and finds that net profit margins and return on assets go down after the IPO. Chi and Padget (2006) compare the financial and operating performance of 382 companies in 1996 and 1997 in China. The results show that earnings per share, return on equity, return on assets, sales growth rate, efficiency (asset turnover), and leverage decrease significantly. Kurtaran and Er (2008) analyze the financial performance of 175 companies on the Istanbul Stock Exchange in 1992-2000. They report that return on assets, total assets turnover, operating cash flow and capital expenditure decrease but net sales experience an increase. Using Indian IPOs, Lukose and Rao (2003) report that return on assets, net profit margin, total assets turnover, and operating cash flow decrease significantly in the years after the IPO year. Pastusiak et al. (2016) test 527 companies during the period 1991-2012 on the Warsaw Stock Exchange and finds that return on equity and return on assets decline after the IPO, but the operating profit margin and net profit margin increase. Kim et al. (2004) analyze 133 firms in Thailand and find an increase in total assets turnover and a decrease in return on assets. Kuria (2014) analyzes 61 companies listed on the Nairobi Stock Exchange and shows that current ratio, return on assets, fixed asset turnover, and return on sales decrease after the IPO. Munisi (2017) tests 14 companies listed on the Tanzania stock exchange, and finds the return on assets and total assets turnover increase but return on equity and capital employed decline.

Some studies have also been carried out using Indonesian IPOs. The results are mixed. For example, Kusumawati et al. (2014) and Panggau and Yuniati (2014) find that current ratio increases after conducting an IPO. Panggau and Yuniati (2014) also report a significant decrease of debt to asset ratio, debt to equity ratio, net profit margin, total assets turnover, and return on equity following the IPO year. Kusumawati et al. (2014) find that debt to equity ratio has increased. Based on the findings of previous researches, this study focuses on six financial ratios, namely current ratio, debt to assets ratio, debt to equity ratio, total assets turnover, net profit margin, and return on equity. As an IPO is selling equity and the firm generates money for various constructive activities to improve its performance, we predict that in the period after the IPO all the financial ratios being examined are improving.

Research Methods

The population of this research are 123 companies making IPO at Indonesia Stock Exchange during 2010-2014.

The sample is determined using purposive sampling by employing the following criteria.

1. The relisting company is excluded as the company has been a public company and its performance has been known previously.
2. The company that went public after the month of April for the year is excluded as its financial reports for the latest year immediate to the IPO year are not available.
3. The company must not have a corporate action such as mergers or acquisitions during the period of analysis as the actions will affect its financial performance.

To illustrate the framework of our study, Figure 1 illustrates the timeframe of the study. We focus our analysis using Panel A, as we only examine the firm making IPO between May and December. We exclude IPO firms that went public between January and April as their full-year financial reports will be two years before the year of offering (Panel B). Under this scenario, it is not comparable with the time frame for the IPO date of May and December (Panel A).

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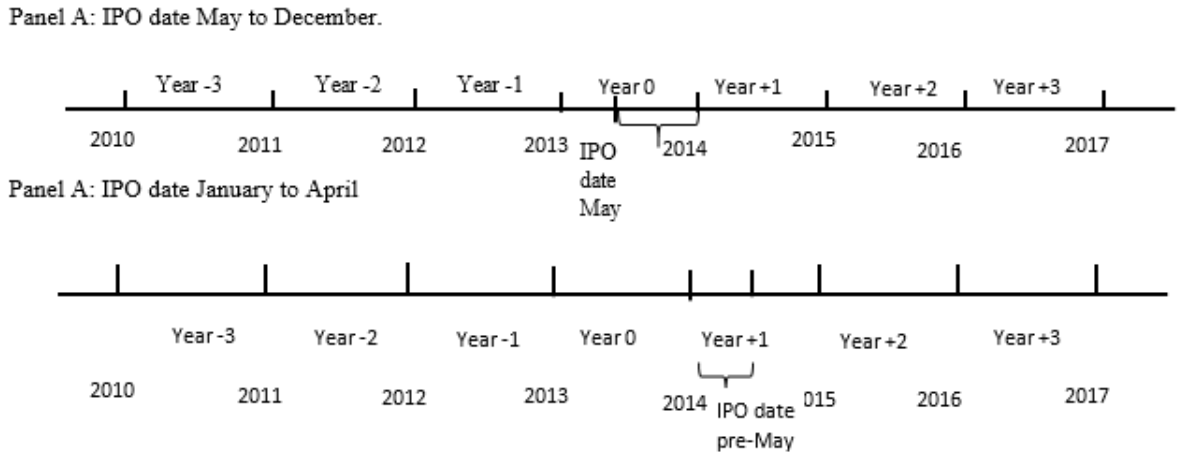

Figure 1: Framework of Period of Analysis

The sample selection process is presented in Table 1. In Table 1 it can be seen that the final sample of this study consists of 59 companies for years 2010-2013 and 49 companies for the year 2014.

Table 1. Sample Selection Process

No	Description	Number of Company
1	Number of companies conducting IPO years 2010-2014	123
2	The relisting company	-1
3	Non-relisting company	122
4	The company went public from January to April	-50
5	The company went public after the month of May	72
6	The company with corporate actions (mergers or acquisitions) after the IPO	-13
7	Non-corporate actions company (Final sample)	59

There are six variables examined in the current study. These include four ratio groups, those are liquidity ratio, solvency ratio, activity ratio, and profitability ratio. The measurement of each research variable is described as follows. Current Ratio is measured as a ratio of Current assets over current liabilities. Debt to assets ratio is calculated as the ratio of total liabilities over total assets. Debt to equity ratio is measured as a ratio of total liabilities over total equity. Total assets turnover is the ratio of sales over total assets. Net profit margin is calculated by dividing net income after tax over sales. Return on equity is expressed as the ratio between net profit after tax and total equity.

Results and discussion

Table 2 presents a statistical description of each research variable. As can be seen in Table 2, the average value of the current ratio, debt to assets ratio, debt to equity ratio, total assets turnover, net profit margin and return on equity fluctuate. Nevertheless, there is a trend that the current ratios are good, the debt adequacy ratio improves, and the activity ratio and profitability ratios decrease. In other words, not all IPOs have improved post-IPO financial performance. To find out whether the post-IPO financial performance is less encouraging, this study performs a non-parametric-based test that is the Wilcoxon paired sample test. This is done because not all of the data are normally distributed.

Variable	Period	Mean	Median	Stand. Dev	Minimum	Maximum
Current ratio	t-3	1.8356	1.1723	1.7908	0.1408	9.0401
	t-2	1.5046	1.1935	1.2051	0.2054	7.8186
	t-1	1.4338	1.2214	1.0910	0.1684	6.1030

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Variable	Period	Mean	Median	Stand. Dev	Minimum	Maximum
	t-0	2.3700	1.4720	2.3596	0.1138	10.880
	t+1	2.3848	1.4317	2.7043	0.0860	12.995
	t+2	2.1018	1.2444	2.4513	0.2428	14.030
	t+3	1.8920	1.3290	1.8840	0.1933	10.287
Debt to assets ratio	t-3	0.6081	0.6661	0.2568	0.1006	0.9828
	t-2	0.6097	0.6438	0.2207	0.2127	0.9461
	t-1	0.5762	0.6164	0.2256	0.0246	0.9289
	t-0	0.5377	0.4640	0.4775	0.0286	3.6142
	t+1	0.5406	0.5026	0.4702	0.0330	3.4915
	t+2	0.5025	0.4771	0.2385	0.0098	0.8950
	t+3	0.5080	0.5076	0.2406	0.0368	0.8958
Debt to equity ratio	t-3	3.1545	1.9745	3.5658	0.1119	19.319
	t-2	2.8224	1.5688	2.9533	0.2701	13.520
	t-1	2.4227	1.6062	2.5435	0.0327	13.063
	t-0	1.7199	0.8573	2.1711	0.0592	11.323
	t+1	1.6659	0.7879	2.2588	0.0613	11.846
	t+2	1.8127	0.9123	1.9678	0.0108	8.5193
	t+3	1.8240	1.0308	1.9742	0.0583	8.5938
	t-3	0.8078	0.5470	0.7853	0.0175	4.1522
	t-2	0.9578	0.5570	1.4717	0.0002	9.8333
Total assets turnover	t-1	0.7220	0.5495	0.7471	0.0015	3.6097
	t-0	0.5821	0.4029	0.5496	0.0398	2.3552
	t+1	0.6148	0.4292	0.6273	0.0610	3.3142
	t+2	0.5506	0.3807	0.5320	0.0417	2.5446
	t+3	0.5504	0.3801	0.5465	0.0099	2.3612
Net profit margin	t-3	0.1531	0.1024	0.2786	-0.316	1.5572
	t-2	0.5745	0.1040	3.4608	-0.865	26.6465
	t-1	0.2080	0.0875	0.3882	-0.035	2.3521
	t-0	0.1905	0.0978	0.3924	-0.998	1.8568
	t+1	0.1532	0.0839	0.2660	-0.161	1.7713
	t+2	0.0505	0.0678	0.2943	-1.300	0.8399
	t+3	0.0971	0.0639	0.3553	-0.645	1.9845
Return on equity	t-3	0.1798	0.1333	0.1722	-0.049	0.7631
	t-2	0.1947	0.1269	0.2225	-0.207	1.2270
	t-1	0.2331	0.1438	0.3471	-0.008	1.9046
	t-0	0.3550	0.1222	1.7782	-0.684	13.6921
	t+1	0.1004	0.0988	0.1011	-0.279	0.3782
	t+2	0.0410	0.0711	0.1957	-0.983	0.2575
	t+3	0.0499	0.0681	0.1322	-0.559	0.2945

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The results of hypotheses testing are presented in Table 3. All tests are based on the non-parametric test, the Wilcoxon Signed Rank test of pair samples. Not reported here, the results of tests using a t-test for pair samples are not qualitatively different as the non-parametric test.

Panel A indicates that the median current ratio value tends to increase compared with the value of the benchmark year or the base year, that is a year before the year of going public. The median values of the current ratio in the IPO year up to three years later are higher than the value of the base year. The median value of the companies show increasing trends from the three year before the offering year (t-3). Yet, the median values are statistically significant from year-0 up to year t+3.

In general, it can be said that there has been an increase in the current ratio values after the IPO. We argue that companies conducting IPOs are able to increase the portion of current assets so that the ability to meet the current liabilities is more warranted. In other words, on average, IPO companies are able to improve their current ratio performance. The result of this study is consistent with Panggau and Yuniati (2014) and Kusumawati et al. (2014) where both studies find an increase in current assets value following the IPO.

Panel B shows that debt to assets ratio tends to increase up to the year of offering, from year t-3 to the year where the IPO takes place. The median values of debt to assets ratios then decrease following the IPO year, from year t+1 to year t+3. The median value of debt to assets ratio is significantly higher on the year of offering compared to the base year (t-1). Following the year of IPO, the median values of debt to assets ratio decreases significantly.

We notice that the decreasing values of debt to assets ratio is a good signal. This implies that the company has received a significant portion of IPO funds making the assets to increase which in turn bring down the ratio of debt over the assets. The fund generated from the public issue is largely responsible for the increase in the total assets. The results of this study are consistent with Chi and Padget (2004) and Panggau and Yuniati (2014) who report that the debt to assets ratio has decreased after the IPO. In other words, the debt to assets ratio is improving.

A phenomenon that is not much different is found for the debt to equity ratio (Panel C). The median debt to equity ratio goe down drastically in the IPO year and in the years post the IPO year. The decrease is statistically significant. This condition is not uncommon considering that the company receives substantial funds from the selling the shares which will automatically increase the value of its equity. That is, because there are funds coming through the sale of shares, the value of equity increases and consequently the debt to equity ratio decreases.

The changes of total assets turnover after the IPO are shown in Panel D. It appears in Panel D that the total asset turnover value is statistically decreasing starting from the year of the IPO. Total assets turnover increases in the two years before IPO, but it continues to decline after the IPO.

Going public for the first time is a reflection of strong optimism. The company receives funds to be used for productive activities, such as investment, pay debt, expansion, or strengthening working capital. It seems that most of the companies are unable to increase their efficiency. The decreasing value of assets turn over indicters that companies are not able to lever the additional funds from the IPO to significantly increase the sales. The results of this study are consistent with most of the previous studies, such as Jain and Kini (1994), Lukose and Rao (2003), Kurtaran and Er (2008), Analazi and Liu (2013), Kusumawati et al. (2014), and Panggau and Yuniati (2014). The claim of Jain and Kini (1994) that most of the companies making up their financial performance before the IPO may be responsible for the declining of their activity ratio.

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Description	Year relative on the year of IPO											
	From t-3 to t-1		From t-2 to t-1		From t-1 to t0		From t-1 to t+1		From t-1 to t+2		From t-1 to t+3	
	-3	-1	-2	-1	-1	0	-1	+1	-1	+2	-1	+3
Panel A: Current Ratio												
Median	1.1723	1.2214	1.1935	1.2214	1.2214	1.4720	1,2214	1,4317	1,2214	1,2444	1,2665	1,3290
Median Different	-0.0491		-0.0279		-0.506***		-0.2103***		-0.0230**		-0.0625**	
p-Value (Median)	0.1270		0.1420		0.0000		0.0030		0.0490		0.0415	
Number of data	59		59		59		59		59		49	
Panel B: Debt to Assets Ratio												
Median	0.5076	0.6164	0.6661	0.6164	0.6164	0.6438	0,6164	0,4640	0,6164	0,4771	0,6163	0,5076
Median Different	0.1088		0.0497		-0.0274***		0.1524***		0.1393***		0.1087**	
p-value	0.1905		0.1023		0.0005		0.0000		0.0004		0.0112	
Number of data	59		59		59		59		59		49	
Panel C: Debt to Equity Ratio												
Median	1.9745	1.6062	1.5688	1.6062	1.6062	0.8573	1,6062	0,7879	1,6062	0,9123	1,5922	1,0308
Median Different	0.3683*		-0.0374		0.7489***		0.8183***		0.6939***		0.5614**	
p-value	0.0725		0.2230		0.0000		0.0000		0.0010		0.0110	
Number of data	59		59		59		59		59		49	
Panel D: Total Asset Turnover												
Median	0.5470	0.5495	0.5570	0.5495	0.5495	0.3985	0,5495	0,4292	0,5495	0,3807	0,6123	0,3801
Median Different	-0.0025**		0.0075		0.1510***		0.1203***		0.1688***		0.2322***	
p-value	0.0185		0.1815		0.0015		0.0045		0.0005		0.0010	
Number of data	59		59		59		59		59		49	
Panel E: Net Profit Margin												
Median	0.1024	0.0875	0.1040	0.0875	0.0875	0.0978	0,0875	0,0839	0,0875	0,0678	0,0874	0,0639
Median Different	0.0149***		0.0165***		-0.0103		0.0036		0.0197***		0.0235***	
p-value	0.0025		0.0035		0.1095		0.1435		0.0000		0.0000	
Number of data	59		59		59		59		59		49	
Panel F : Return on Equity												
Median	0.1333	0.1438	0.1269	0.1438	0.1438	0.1222	0,1438	0,0988	0,1438	0,0711	0,1457	0,0681
Median Different	-0.0105		-0.0169		0.0216***		0.0450***		0.0727***		0.0776***	
p-value	0.1905		0.1885		0.0005		0.0000		0.0000		0.0000	
Number of data	59		59		59		59		59		49	

Note: ***, **, * denote significant at α= 1%, 5%, and 10%, respectively. All tests are based on two-tailed test.

Conclusion

This study aims to examine the changes in financial performance prior to and after the IPO. Based on the results, the following conclusions can be generated. The value of the current ratio is better after the IPO as indicated by the increase in the median value of that ratio. Debt to asset ratio and debt to equity ratio in the period after the IPO

decrease, which means the liability ratio is improving. Total asset turnover is no better after the IPO year. Net profit margin and return on equity in the period after IPO decrease significantly.

There are two things that can be regarded as the limitation of research and at the same time, they can be us as the starting point for future research. Firstly, this study does not differentiate companies in their sector. It is undeniable that performance across sectors or between industries is not always comparable. Therefore, future research can make comparisons between sectors or between industries. Second, this study does not explore cash flow-based performance. Given the importance of cash flow for securities valuation, future studies may emphasize the analysis of changes in cash flows between before and after the IPO.

References

[1] Ahmad, A. 2011. Ownership structure and the operating performance of Malaysia companies. *International Review of Business Research*, 7 (6):1-13.

[2] Alanazi, S.A., and B. Liu. 2013. IPO financial and operating performance: Evidence from the six countries of the GCC. Discussion *Paper Finance* No. 04. Griffith Business School.

[3] Chi, J., and C. Padgett. 2006. Operating performance and its relationship to market performance of Chinese initial public offering. *Chinese Economy*, 39 (5): 30-47.

[4] Friedlan, J.M., 1994. Accounting choices of issuers of initial public offerings, *Contemporary Accounting Research*, 11(1): 1-32.

[5] Jain, A.B., and O. Kini. 1994. The post-issue operating performance of IPO firms. *Journal of Finance*, 49 (5):1702-1725.

[6] Kim, K.A., P. Kitsabunnarat, and J.R. Nofsinger. 2004. Ownership and operating performance in an emerging market: Evidence from Thai IPO firms. *Journal of Corporate Finance*, 10 (3): 355-380.

[7] Kim, M., and J.R. Ritter. 1999. Valuing IPOs. *Journal of Financial Economics*, 53 (3): 409-437.

[8] Kuria, E.G. 2014. The effects of initial public offering on the financial performance of companies listed at Nairobi. *Dissertation*. Nairobi. Business Administration. University of Nairobi.

[9] Kurtaran, A., and B. Er. 2008. The post-issue operating performance of IPOs in an emerging market: Evidence from Istanbul Stock Exchange. *Investment Management and Financial Innovations*, 5 (4): 52-61.

[10] Kusumawati, F.L., Kertahadi, and Darminto. 2014. Analisis kinerja keuangan perusahan sebelum dan sesudah initial public offering (IPO) di Bursa Efek Indonesia (Studi perusahaan yang listing di BEI tahun 2009). *Jurnal Administrasi Bisnis*, 8 (2): 1-8.

[11] Lukose, P.J.J. and S.N. Rao. 2003. Operating performance of the firms issuing equity through rights offer. *Vikalpa*, 28(4): 25-40.

[12] Munisi, G.H. 2017. Financial performance of initial public offerings: Companies listed on Dares Salaam Stock Exchange. *Business and Economics Journal*. 8(2): 2-5.

[13] Panggau, J.D., and T. Yuniati. 2014. Kinerja keuangan antara sebelum dan sesudah initial public offering (IPO) pada perusahaan LQ 45. Jurnal Ilmu & Riset Manajemen. 3 (8): 1-20.

[14] Pastusiak, R., K. Miszczyńska, and B. Krzeczewski. 2016. Does public offering improve company's financial performance? The example of Poland, *Economic Research-Ekonomska Istraživanja*, 29(1): 32-49,

[15] Saiful. 2004. Hubungan manajemen laba (earnings management) dengan kinerja operasi dan return saham di sekitar IPO. *Jurnal Riset Akuntansi Indonesia*, 7 (3): 316-332.

[16] Teoh, S.H., T.J. Wong, and G. Rao, 1998. Are accruals during initial public offerings opportunistic?, *Review of Accounting Studies*, 3(1-2): 175-208.

[17] Xue Li, , Vasu D. Chakravarthy, , Bin Wang, and Zhiqiang Wu, "Spreading Code Design of Adaptive Non-Contiguous SOFDM for Dynamic Spectrum Access" in IEEE JOURNAL OF SELECTED TOPICS IN SIGNAL PROCESSING, VOL. 5, NO. 1, FEBRUARY 2011

[18] J. D. Poston and W. D. Horne, "Discontiguous OFDM considerations for dynamic spectrum access in idel TV channels," in Proc. IEEE DySPAN, 2005.

[19] R. Rajbanshi, Q. Chen, A.Wyglinski, G. Minden, and J. Evans, "Quantitative comparison of agile modulation technique for cognitive radio tranceivers," in Proc. IEEE CCNC, Jan. 2007, pp. 1144–1148.

[20] V. Chakravarthy, X. Li, Z. Wu, M. Temple, and F. Garber, "Novel overlay/underlay cognitive radio waveforms using SD-SMSE framework to enhance spectrum efficiency—Part I," IEEE Trans. Commun., vol. 57, no. 12, pp. 3794–3804, Dec. 2009.

[21] V. Chakravarthy, Z. Wu, A. Shaw, M. Temple, R. Kannan, and F. Garber, "A general overlay/underlay analytic expression for cognitive radio waveforms," in Proc. Int. Waveform Diversity Design Conf., 2007.
[22] V. Chakravarthy, Z. Wu, M. Temple, F. Garber, and X. Li, "Cognitive radio centric overlay-underlay waveform," in Proc. 3rd IEEE Symp. New Frontiers Dynamic Spectrum Access Netw., 2008, pp. 1–10.
[23] X. Li, R. Zhou, V. Chakravarthy, and Z. Wu, "Intercarrier interference immune single carrier OFDM via magnitude shift keying modulation," in Proc. IEEE Global Telecomm. Conf. GLOBECOM , Dec. 2009, pp. 1–6.
[24] Parsaee, G.; Yarali, A., "OFDMA for the 4th generation cellular networks" in Proc. IEEE Electrical and Computer Engineering, Vol.4, pp. 2325 - 2330, May 2004.
[25] 3GPP R1-050971,"R1-050971 Single Carrier Uplink Options for EUTRA: IFDMA/DFT-SOFDM Discussion and Initial Performance Results ",http://www.3GPP.org,Aug 2005
[26] IEEE P802.16e/D12,'Draft IEEE Standard for Local and metropolitan area networks-- Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems', October 2005
[27] 3GPP RP-040461, Study Item: Evolved UTRA and UTRAN, December 200
[28] R. Mirghani, and M. Ghavami, "Comparison between Wavelet-based and Fourier-based Multicarrier UWB Systems", IET Communications, Vol. 2, Issue 2, pp. 353-358, 2008.
[29] R. Dilmirghani, M. Ghavami, "Wavelet Vs Fourier Based UWB Systems", 18th IEEE International Symposium on Personal, Indoor and Mobile Radio Communications, pp.1-5, Sep. 2007.
[30] M. Weeks, Digital Signal Processing Using Matlab and Wavelets, Infinity Science Press LLC, 2007.
[31] S. R. Baig, F. U. Rehman, and M. J. Mughal, "Performance Comparison of DFT, Discrete Wavelet Packet and Wavelet Transforms in an OFDM Transceiver for Multipath Fading Channel,", 9th IEEE International Multitopic Conference, pp. 1-6, Dec. 2005.
[32] N. Ahmed, Joint Detection Strategies for Orthogonal Frequency Division Multiplexing, Dissertation for Master of Science, Rice University, Houston, Texas. pp. 1-51, Apr. 2000.