Bibliography on stable distributions, processes and related topics

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The following sections are a start on organizing references on stable distributions by topic. It is far from complete. Starting on page 11 there is an extensive list of papers on stable distributions, many of which are not included in the first section. Some of the papers there do not directly refer to stable distributions. Someday I may have the time to edit those out, but for now please ignore those references. Part of this list was originally provided by Gena Samorodnitsky at Cornell.

I am interested in adding more references that you may have. Please e-mail corrections and additions to the above address, ideally in BibTeX form, especially if you have more than a few additions.

Contents

1 Univariate stable distributions

1.1 General references

Zolotarev (1986b), Uchaikin and Zolotarev (1999), Samorodnitsky and Taqqu (1994b), Nikias and Shao (1995), Ibragimov and Linnik (1971), Nolan (2009c)

1.2 Computations of stable densities, cdf, etc.

Worsdale (1975), Panton (1992), Nolan (1997), Nolan (1999a), Robinson (2003a), Robinson (2003b), Robinson (2003c), Matsui and Takemura (2004), Matsui (2005), Chekhmenok (2003), Cheng and Liu (1997).

1.3 Generalized Central Limit Theorem and Domains of Attraction

de Haan and Peng (1999), Geluk and de Haan (2000), Geluk and Peng (2000), de Haan et al. (2002)

1.4 Statistical estimation, diagnostics, assessing fit, hypothesis testing

Existence of spectral measures: Feldheim (1937), Lévy (1954), Courrège (1964) Nolan (2001a), Kogon and Williams (1998), McCulloch (1986), Nikias and Shao (1995), Tsihrintzis and Nikias (1996), Nolan (1998b), Nolan (1999b), Ojeda (2001), Beaulieu et al. (2005), Dufour and Kurz-Kim (2005), Garcia et al. (2004), Fan (2006)

Bayesian MCMC approach Buckle (1993), Buckle (1995).

General information on assessing fit D'Agostino and Stephens (1986), Frain (2007b), Matsui and Takemura (2008)

Estimation of concentration data Benson et al. (2001), Rishmawi (2005)

Characterization problems: Yanushkevichius and Yanushkevichiene (2007)

2 Application areas

2.1 Engineering

The standard models of signal processing are based on Gaussian noise. While this works well in many problems, this assumption is not accurate in some situations where there is impulsive, heavy-tailed noise. In such situations, linear Gaussian filters perform poorly. Using methods based on stable models gives robust non-linear signal processing methods.

General books: Nikias and Shao (1995), Arce (2005)

General: Kuruoglu (1998), Der (2003), Lowen and Teich (1990), Ma and Nikias (1995), Pierce (1997), Tsakalides and Nikias (1995), Keshner (1982),

Tsihrintzis and Nikias (1996), Ma and Nikias (1995), Kuruoglu and Fitzgerald (1998), Kuruoglu et al. (1998), Astola and Neuvo (1992), Kuruoglu et al. (1997), Kuruoglu et al. (1998), Kosko (2006), Gonzalez et al. (2006), Kalluri and Arce (1998) Ilow et al. (1998), Ilow (1995), Ilow (1998), Ilow (1999), Ilow and Hatzinakos (1997), Ilow and Hatzinakos (1998), Nunez et al. (2008), Nolan (2008), Gonzalez et al. (1997), Gonzalez and Nolan (2007), Wang et al. (2009).

Stuck (2000) gives an overview of early work on stable laws in signal processing. See also: Stuck (1976a), Stuck (1976b), Stuck (1978), and Newman and Stuck (1979).

2.1.1 Radar processing

Banerjee et al. (1999), Kapoor et al. (1999), Achim et al. (2002), Achim et al. (2003), Amiri and Amindavar (2005), Belkacemi and Marcosa (2007), Messali and Soltani (2007), Tsakalides and Nikias (1999), Tsakalides et al. (1999), Tsakalides et al. (2000), Pierce (1996), Lee (1999), Kuruoglu and Zerubia (2004), Nolan and Nunez (2009).

2.1.2 Image processing

Carassso (2002), Carassso (2006), Kuruoglu and Zerubia (2003), Arce (2005)

2.1.3 Telecommunications

Land lines: Stuck and Kleiner (1974). Cell phones: Yang and Petropulu (2001b), Gonzalez (1997), Aysal (2007), Georgiadis (2000), Georgiadis (2001), Georgiadis (2005)

2.1.4 Acoustics (including sonar and ultrasound)

Kidmose (2001), Kidmose (2002), Chitre et al. (2006), Chitre et al. (2004), Chitre et al. (2005), Chitre et al. (2007), Szabo (1994), Kelly and McGough (2007), Kelly et al. (2008), Kelly (2008), Zha and Qiu (2006a), Zha and Qiu (2006b), Kyriakakis et al. (1999), Petropulu et al. (1996), Peterson et al. (2003), Georgiou et al. (1999), Achim et al. (2001), Taroudakis et al. (2006), Petropulu et al. (1996).

2.1.5 Network modeling

Erramilli et al. (1996), Leland et al. (1994), Parulekar and Makowski (1996), Paxson and Floyd (1994), Willinger et al. (1997), Souryal et al. (2003), Wolpert and Taqqu (2005), Mikosch et al. (2002), Beran et al. (1995), Petropulu et al. (2000), Yang and Petropulu (2001a), Yang and Petropulu (2003), Yu et al. (2005), Cappé et al. (2002)

2.1.6 Queueing theory

Heath et al. (1997), Heath et al. (1998), Heath et al. (1999), Volume 33 of Queueing Systems (1999). Boxma and Dumas (1996), Resnick and Samorodnitsky (1997b), Resnick and Samorodnitsky (2001), Resnick and Samorodnitsky (1997a), Szczotka and Woyczyński (2004), Szczotka and Woyczyński (2003)

2.2 Finance, Economics, Value at Risk, Real Estate, Insurance

The main motivation for considering stable laws in finance is that empirical returns have heavier tails than the normal/Gaussian model predicts. And stable laws allow one to model cumulative returns using the stability of sums: if $X_1, X_2, \ldots, X_n$ are returns over one period with an α-stable distribution, then the cumulative return over n time periods $X_1 + X_2 + \cdots + X_n$ also has an α-stable distribution. This is true if the terms are independent or dependent stable, but is not true for other models of returns.

2.2.1 Modeling asset returns

Rachev and Mittnik (2000), Nolan (2003), Mandelbrot (1960), Mandelbrot (1961), Mandelbrot (1963b), Fama (1963), Fama (1965), Fama and Roll (1968), Rachev (2003), McCulloch (1996a), McCulloch (1997), Bidarkota and McCulloch (1998), Peters (1994), Walter (1999), Belkacem et al. (2000), Haas et al. (2005), Lombardi and Calzolari (2005), Ortobelli and Rachev (2005), Borak et al. (2005), Martin et al. (2006), Frain (2007a), Stuck (1976c), Leitch and Paulson (1975), Kozubowski et al. (2003). Jama (2009) looks at returns on the South African exchange, Cont and Tankov (2004), Tankov (2007), Kallsen and Tankov (2006).

2.2.2 Option pricing

McCulloch (1996a), Carr and Wu (2003), Cartea and Howison (2003), Cartea and Howison (2007), Vollert (2001), Hurst et al. (1999), Hauksson and Rachev (2001).

2.2.3 Value at risk

Khindanova et al. (2001), Lamantia et al. (2004), Marinelli et al. (2006), Frain (2008).

2.2.4 Roreign exchange/parallel market rates

Basterfield et al. (2003), Basterfield et al. (2005a), Basterfield et al. (2005b), Fofack and Nolan (2001), Lan and Tan (2007).

2.2.5 Real estate

King and Young (1994), Young and Graff (1995), Graff et al. (1997), Brown (2000), Brown (2004), Brown (2005),Young et al. (2006), Young (2008). The first paper above argues that because of the non-normality of real estate prices, diversification is not a good idea (unless you have a huge portfolio); careful management of property is more important.

2.2.6 Insurance

Asmussen et al. (1997), Embrechts et al. (1997)

2.2.7 Miscellaneous

De Vany and Walls (1999), De Vany and Walls (2004) and De Vany (2003) argue that the extreme volatility in Hollywood movie revenues can be modeled with stable laws. De Vany (2006) uses truncated stable laws to model home runs in baseball.

Commodity pricing Weron (2005), Jin (2005).

Extension of CAPM to include stable laws, portfolio selection: Fama (1971), Rachev et al. (2005), Bawa et al. (1979), Rachev and Han (2000), Ortobelli et al. (2002), Ortobelli et al. (2004), Stoyanov et al. (2006).

Vector autoregression: Hannsgen (2008) discusses whether there are heavy tailed distributions involved in structural VAR used for policy analysis. The presence of infinite variance makes the use of structural VAR questionable.

Lau and Lau (1993), Lau and Lau (1997), Fielitz and Rozelle (1983)

Ibragimov (2005) discusses consequences of heavy tails for economic models.

Anderson (2006) discusses the "Long Tail" occurring in sales, where many low volume items can account for significant revenue.

Copulas: Prange and Scherer (2006), Kallsen and Tankov (2006).

Computational issues: Rachev (2004)

2.3 Extreme value theory

Fougéres et al. (2009) build models for multivariate dependent extreme value distributions using mixtures with stable models.

2.4 Computer science

Indyk (2000), Cormode et al. (2002), Cormode (2003), Cormode and Muthukrishnan (2003), Cormode et al. (2002), Harchol-Balter et al. (1998), Harchol-Balter (1999), Gomes and Selman (1999), Gilbert et al. (2002),

2.5 Random walks

In random environments: Kesten et al. (1975), Mayer-Wolf et al. (2004)

2.6 Physics, astronomy and chemistry

Montroll and Bendler (1984), Montroll and Shlesinger (1982), Metzler and Klafter (2000), Liu and Chen (1994), Williams and Watts (1970), Strobl (1997), Boldyrev and Gwinn (2003), Bendler (1984), Freeman and Chisham (2005), Metzler and Klafter (2002), Kohlrausch (1847), Csörgő et al. (2004), Anderssen et al. (2004), Peach (1981), Hetman et al. (2003), Lan (2001), Lan (2002).

ben Avraham and Havlin (2000), Ott et al. (1990), Bardou et al. (2002)

2.7 Survival analysis, frailty, reliability

Hougaard (1986), Wassell et al. (1999), Dey and Ravishanker (2000), Dey et al. (1999), Mallick and Ravishankaer (2004), Gaver et al. (2004)

2.8 Fractional/anomalous diffusions

Stable densities give the Greens functions for certain fractional differential equations. Gorenflo and Mainardi (1998a), Mainardi et al. (2001), Gorenflo et al. (2007), Gorenflo et al. (2002a), Paradisi et al. (2001), Gorenflo and Mainardi (2001), Gorenflo et al. (2002b), Mainardi et al. (2006), Gorenflo et al. (1999), Gorenflo and Mainardi (1998b), Meerschaert et al. (2002), Ditlevsen (2004)

2.9 Dynamical systems and ergodic theory

Gouëzel (2004), Gouëzel (2007), Guivarc'h and Le Page (2008), Zweimüller (2003)

2.10 Geology and Geophysics

Painter et al. (1995), Gaynor et al. (2000), Painter (2001), Gunning (2002), Velis (2003), Molz et al. (2004), Sahimi and Tajer (2005). Marcus (1970), Li and Mustard (2000), Li and Mustard (2005), Rishmawi (2005), Zaliapin et al. (2005), Meerschaert et al. (2004), Hill and Tiedeman (2007)

Earthquake modeling: Lavallée and Archuleta (2003)

2.11 Miscellaneous: rainfall, reliability, etc.

Modeling rainfall: Menabde and Sivapalan (2000). Reliability testing: Gaver et al. (2004).

Climatology: Lavallée and Beltrami (2004)

There have been several papers using Lévy flights to describe foraging behavior for different animals, see Viswanathan et al. (1996) and Viswanathan et al. (1999). However, recent work points out some errors in the data used in these papers and questions the relevancy of heavy tailed models for foraging, see Edwards et al. (2007) and Travis (2007).

Scaling laws in human travel Brockmann et al. (2006).

Wrapped stable Jammalamakaka and SenGupta (2001), Gatto and Jammalamadaka (2003), Pewsey (2006)

Tuerlinckx (2004) uses a positive stable law to model a multivariate counting model for response times in psychology.

Heinrich (1987) considers sums of ψ-mixing random variables and a connection with continued fractions. Heinrich et al. (2004) relate stable laws to rounding errors.

3 Multivariate stable distributions

3.1 General references

Samorodnitsky and Taqqu (1994b), overview Nolan (1998a)

Existence of spectral measures: Feldheim (1937), Lévy (1954), Courrège (1964)

3.2 Estimation

Rachev and Xin (1993), Cheng and Rachev (1995), Nolan et al. (2001), Nolan and Panorska (1997), Pivato and Seco (2003)

3.3 Multivariate stable densities, cdf, simulation, etc.

Nolan and Rajput (1995), Abdul-Hamid (1996), Abdul-Hamid and Nolan (1998), Nolan (2009b), Nolan (2005b).

For simulation, see Modarres and Nolan (1994) for discrete spectral measures. Can also simulate radially symmetric and elliptically contoured using sub-Gaussianity, this is used in Nolan (2005b). Sub-stable vectors can be simulated in the same way. And sums of any of the above are stable.

Tails of multivariate stable densities: Hiraba (2003), Watanabe (2007)

3.4 Dependence measures

Chapter 4 of Samorodnitsky and Taqqu (1994b), summary and proposed measures in Nolan (2001b), Boland et al. (2000), Levy. and Taqqu (2005), Samorodnitsky and Taqqu (1993), Mohammadpour et al. (2006)

3.5 Approximation and metrics

Byczkowski et al. (1993), Rachev (1991), Davydov and Paulauskas (1999), Davydov and Nagaev (2002b), Nolan (2009a)

3.6 Miscellaneous

Substable: Misiewicz and Takenaka (2002)

4 Regression, time series, etc.

4.1 Regression

Barmi and Nelson (1997), McCulloch (1998a), Ojeda (2001), Nolan and Ojeda (2006), LePage et al. (1998), LePage and Podgórski (1996), Kurz-Kim et al. (2005), Paulauskas and Rachev (2003), Blattberg and Sargent (1971), Hannsgen (2008).

4.2 Time series

Cline and Brockwell (1985), Davis and Resnick (1986b), Part II of Adler et al. (1998), Calder (1998), Qiou and Ravishanker (1998), Nolan and Ravishanker (2009), Resnick et al. (1999), Resnick et al. (2000a), Section 13.3 of Brockwell and Davis (1991), Andrews et al. (2007)

5 Stable processes

5.1 General references

Samorodnitsky and Taqqu (1994b), Janicki and Weron (1994)

5.2 Stochastic integrals and series

Samorodnitsky and Taqqu (1994b), Rosiński (1995), Kwapień and Woyczyński (1992), Rosiński (1990b), Rosiński (1992), Rosiński (1995), Samorodnitsky and Taqqu (1990c), Al-Khach (1997)

5.3 Path properties

Rosiński (1986), Rosiński (1989), Nolan (1988), Nolan (1989a), Nolan (1989b), Cambanis et al. (1990), Nolan (1991), Rosiński et al. (1991), Rosiński and Samorodnitsky (1993), Samorodnitsky (1988), Samorodnitsky (1993b), Adler (1990)

Laws of the iterated logarithm: Brieman (1968), Mijnheer (1975), Oodaira (1973), Albin (1992), Dehling and Taqqu (1989b), Kôno (1983b), Monrad and Rootzén (1995), Taqqu (1977), Taqqu and Czado (1985b).

Level crossings. Gaussian and case: Marcus (1977), Marcus and Shen (1997), Slud (1991), Slud (1992b), Slud (1992a). Stable case: Adler et al. (1993), Adler and Samorodnitsky (1997), Marcus (1989), Michna and Rychlik (1992a), Michna and Rychlik (1992b), Marcus and Shen (1998).

Maxima/extremes: Heyde (1969), Aleškevičienė (1990), Berman (1992), Molchan (2000), Samorodnitsky (2004b), Samorodnitsky (2004a).

5.4 Miscellaneous

Self-similarity: there are several disjoint classes of self-similar stable processes. See Chapter 7 of Samorodnitsky and Taqqu (1994b). Beran (1986). A general review is Taqqu (1986a), Doukhan et al. (2003).

Long memory/long-range dependence: Taqqu (1986a), Beran (1992), Doukhan et al. (2003), Samorodnitsky (2006)

Local nondeterminism and local times: Berman (1973), Berman (1974), Cuzick (1978), Cuzick (1987), Berman (1983), Berman (1987), Monrad and Pitt (1987), Berman (1991), Nolan (1989b), Soltani (1992), Shieh (1991), Shieh (1992), Xu (1995), Khoshnevisan et al. (2006), Xiao (2006)

Potential theory: Doob (1953), Blumenthal and Getoor (1968), Doob (1984), Jakubowski (2002)

Ergodicity/mixing: Janicki and Weron (1994), Rosiński and Samorodnitsky (1996), Rosiński and Zak (1997)

Ornstein-Uhlenbeck processes: expressions for joint distribution by Wooster (2009)

6 Related distributions and processes

Tempered stable distributions: Rosiński (2004), Terdik and Woyczyński (2006), Houdré and Kawai (2006), Houdré and Kawai (2007), Cohen and Rosiński (2007), Jurek (2007), Rosiński (2007).

Operator stable laws Jurek and Mason (1993), Meerschaert and Scheffler (2001a).

Weakly stable vectors Mazurkiewicz (2007).

α-symmetric multivariate distributions of Cambanis et al. (1983), see Fang et al. (1990).

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