

Journal of Financial and Actuarial Mathematics and Management

A joint edition of the Institute of Information Sciences and Institute of Social Sciences of Perun Academy
Publishing Company: PSP Publishing
ISSN: 2367-5810
Issue 5, Year V (2017)
Founding Editor and Editor-in-Chief: Pavel Stoynov

Editorial Board: Hiroyuki Ono (Japan), Yasukazu Yoshizawa (Japan), Naoyuki Ishimura (Japan), Boris Melnikov (Russia), Elena Melnikova (Russia), Goran Karanovic (Croatia), James Osondu (Nigeria)

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Additive processes – characterization possible generalizations, specific types and simulation

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Abstract.
A parameterization of additive processes is presented. A family of probability distributions called switch time family is introduced - STF(n,β) - with two representatives ST1(n,β) distribution and ST2(n,β) distribution. Corresponding stochastic processes are defined and studied. Simulation and graphics of the distributions and the processes in R languages are done as well as some applications.

Keywords: additive processes; parameterization; switch time family distributions and processes; simulation
MSC 2010: 60G51, 97K60

Additive processes – characterization and possible generalisations

With a given filtered probability space (Ω, F, F_t, P) satisfying the usual conditions, an (one or d-dimensional) additive process is defined as a stochastic process $\{X(t), t \geq 0\}$ which is càdlàg and satisfies the following conditions:

1. $X(0) = 0;$

2. The process has independent increments, i. e. for every sequence of numbers

$$0 < t_1 < t_2 < \cdots < t_n$$

the random variables

$$X(t_1) - X(0), X(t_2) - X(t_1), \ldots, X(t_n) - X(t_{n-1})$$

are independent;

3. The process is stochastically continuous (continuous in probability), i. e.

$$\lim_{t \to s} X(t) = X(s),$$

where the limit is taken by probability.

The additive processes are introduced by Lévy (1937, 1992). Their properties are studied in Sato (1999). In Sato (1999), the following theorem is presented:

Theorem (Sato) Let $\{X(t), t \geq 0\}$ be an additive process with values in R^d. Then:

1. For every $t \geq 0$ the random variable $X(t)$ has infinitely divisible distribution.

2. The distribution of $\{X(t), t \geq 0\}$ is uniquely identified by its point characteristics $\{(A(t), \mu(t), \Gamma(t)), t \geq 0\}$, which are related to the characteristic function in the following way:

$$Ee^{iuX(t)} = e^{\psi(t,u)}$$

and

$$\psi(t,u) = -\frac{1}{2} uA(t)u + iu\Gamma(t) + \int_{R^d} \mu(t, dx)(e^{iux} - 1 - iux1_{\{|x| \leq 1\}}).$$

The point characteristics of the additive process satisfy the properties:

2.1. For every $t \geq 0$ $A(t)$ is positive definite matrix with dimension $d \times d$, $\Gamma(t)$ is a function with values which are vectors in R^d and $\mu(t, dx)$ is a positive measure in R^d, satisfying the conditions $\mu(t, \{0\}) = 0$ and $\int_{R^d} \min(|x|^2, 1)\mu(t, dx) < \infty.$

2.2. $A(0) = 0, \mu(0, dx) = 0, \Gamma(0) = 0$ and for all $t \geq s \geq 0$ the matrix $A(t) - A(s)$ is a positive definite matrix with dimension $d \times d$ and $\mu(s, B) \leq \mu(t, B)$ for all measurable sets $B \in \mathrm{B}(R^d).$

2.3. If $s \to t,$ then $A(s) \to A(t), \Gamma(s) \to \Gamma(t), \mu(s, B) \to \mu(t, B)$ for all measurable sets

$B \in \mathrm{B}(R^d)$, for which $B \subset \{x : |x| \geq \varepsilon\}$ for some $\varepsilon > 0$.

Conversely, for the family triples $\{(A(t), \mu(t), \Gamma(t)), t \geq 0\}$, which satisfies 2.1., 2.2. and 2.3. there is an additive process $\{X(t), t \geq 0\}$ with the corresponding point characteristics.

Important special cases of the additive processes are the processes for which there exists the following parametric representation of the point characteristics:

1. $A(t) = \int_0^t \sigma^2(s)ds$, where for every $t \geq 0$ the matrix $\sigma(t)$ is a real matrix with dimension $d \times n$ for which $\int_0^T \sigma^2(t)dt < \infty$ for fixed $T > 0$ such that $\sigma(t)$ is defined in the interval $[0, T]$.

2. $\mu(t, B) = \int_0^t \nu(s, B)ds$ for all measurable sets $B \in \mathrm{B}(R^d)$, where $\{\nu(t), t \in [0, T]\}$ is a family of Lévy measures satisfying the condition $\int_0^T \int_{R^d} \min(|x|^2, 1)\nu(t, dx)dt < \infty$.

3. $\Gamma(t) = \int_0^t \gamma(s)ds$, where $\gamma : [0, T] \to R$ is a deterministic function with finite variation.

For the triple $(\sigma^2(t), \nu(t), \gamma(t))$ we say that it defines the local characteristics of the additive process. The additive processes with local characteristics are semimartingales.

There are different possibilities for generalization of the additive processes.

One way of generalization is to introduce jumps in deterministic moments, as proposed by Kallsen (1998). In this way, the process is not already stochastically continuous and with stationary increments. To characterize such kind of processes, to the point and local characteristics there is a need to add new characteristics identifying the position and the size of these deterministic-time jumps.

The point characteristics become

$$\{(\Theta, K(t), A(t), \mu(t), \Gamma(t)), t \geq 0\},$$

where Θ is a discrete set giving the times of the jumps and $K(t)$ is conditional distribution of the jumps for which

$$K(t, G) = \begin{cases} \mu(t, G) + \varepsilon_0(G)(1 - \mu(t, R)), t \in \Theta \\ 0, t \notin \Theta. \end{cases}$$

Here $\varepsilon_0(G)$ is the Dirac measure in the point 0.

In the case when local characteristics exist we have

$$\{(\Theta, K(t), A(t) = \int_0^t \sigma^2(s)ds,$$

$$\mu(t, G) = \int_0^t \nu(s, G)ds + \sum_{s \in \Theta \cap [0,t]} \mu(s, G) = \int_0^t \nu(s, G)ds + \sum_{s \in \Theta \cap [0,t]} K(s, G \setminus \{0\}),$$

$$\Gamma(t) = \int_0^t \gamma(s)ds + \sum_{s \in \Theta \cap [0,t]} \Delta\Gamma(s) = \int_0^t \gamma(s)ds + \sum_{s \in \Theta \cap [0,t]} \int x K(s, dx)), t \geq 0\},$$

and the local characteristics are:

$$\{(\Theta, K(t), \sigma^2(t), \nu(t), \gamma(t)), t \geq 0\}.$$

A next step of generalization is to allow stochastic characteristics- drift, volatility and jump intensity. The corresponding processes are considered for example in Grigelionis (1973).

In this case, the point characteristics of the process are

$$\{(\Theta, K(\omega, t), A(\omega, t), \mu(\omega, t), \Gamma(\omega, t)), t \geq 0\}$$

and the local characteristics (when they exist) are

$$\{(\Theta, K(\omega, t), \sigma^2(\omega, t), \nu(\omega, t), \gamma(\omega, t)), t \geq 0\}.$$

The obtained characterization allows to specify also some specific jumps in random times and to characterize them separately from the remaining jumps of the process. In this case, the point characteristics can be presented as:

$$\{(\Theta(\omega,t),K(\omega,t),A(\omega,t),\mu(\omega,t),\Gamma(\omega,t)),t\geq 0\}$$

where the random times of the specific jumps are represented by the point process $\{\Theta(\omega,t),t\geq 0\}$.

It is also possible to combine specific jumps in specific random times with jumps in deterministic moments. In this case, the parameters of the process (in the case when local characteristics exist) are:

$$\{(\Theta_1,\Theta_2(\omega,t),K_1(\omega,t),K_2(\omega,t),A(\omega,t)=\int_0^t\sigma^2(\omega,s)ds,$$

$$\mu(\omega,t,G)=\int_0^t\nu(\omega,s,G)ds+\sum_{s\in\Theta_1\cap[0,t]}K_1(\omega,s,G\setminus\{0\})+\sum_{\theta_i<t}K_2(\omega,\theta_i,G\setminus\{0\}),$$

$$\Gamma(t)=\int_0^t\gamma(s)ds+\sum_{s\in\Theta_1\cap[0,t]}\int xK_1(\omega,s,dx)+\sum_{\theta_i<t}\int xK_2(\omega,\theta_i,dx)),t\geq 0\}.$$

Here $K_1(\omega,t)$ and $K_2(\omega,t)$ are the conditional distributions of the jumps in deterministic and specific random times correspondingly.

Switch Time distributions (Stoynov distributions) - STF(n,β)

We say that a random variable ξ with probability mass function $f_\xi(x)$ has distribution of $ST(n,\beta)$ family and denote this fact $\xi\in STF(n,\beta),$ if the probability mass function of ξ is given by the formula

$$f_\xi(x)=\begin{cases}\sum_{k=1}^{n+1}P(D^n=k)\,f_\xi(x\mid D^n=k)=\sum_{k=1}^{n+1}P(D^n=k)\,f_{G^k}(x),x\geq 0\\ 0,x<0.\end{cases}$$

where G^k are random variables with probability mass function $f_{G^k}(x)=f(k,\beta)$ and D^n are random variables taking values $k=1,\ldots,(n+1)$ with probabilities $P(D^n=k)=\dfrac{C(n,\beta)n!}{\beta^k(n-k+1)!},k=1,\ldots,(n+1)$ where the coefficients $C(n,\beta)$ are given by the formulas:

$$C(n,\beta)=\frac{1}{I(n,\beta)},$$

$$I(0,\beta)=\frac{1}{\beta},$$

$$I(n,\beta)=\frac{1}{\beta}+\frac{n}{\beta}I(n-1,\beta),n=1,2,\ldots$$

Also, variables $\tilde{D}^n=D^n-1$ can be introduced taking values $k=0,\ldots,n$ with probabilities

$$P(\tilde{D}^n=k)=\frac{C(n,\beta)n!}{\beta^{k+1}(n-k)!},k=0,\ldots,n.$$

Then the probability mass function $f_\xi(x)$ of ξ may be presented also by the formula

$$f_\xi(x)=\begin{cases}\sum_{k=0}^{n}P(\tilde{D}^n=k)\,f_\xi(x\mid\tilde{D}^n=k)=\sum_{k=0}^{n}P(\tilde{D}^n=k)\,f_{G^{k+1}}(x),x\geq 0\\ 0,x<0.\end{cases}$$

Here for G^k we may adopt different families of distribution. For example, if we take $G^k \in \Gamma(k,\frac{1}{\beta}) \equiv Erlang(k,\frac{1}{\beta}),$ i. e. $\xi \mid D^n \equiv Erlang(D^n,\frac{1}{\beta}),$ we obtain a distribution which we will call $ST1(n,\beta)$ distribution, having probability density function

$$f_\xi(x) = \begin{cases} C(n,\beta)e^{-\beta x}(1+x)^n, & x \geq 0 \\ 0, & x < 0 \end{cases}.$$

Indeed, we have:

$$C(n,\beta)e^{-\beta x}(1+x)^n = C(n,\beta)e^{-\beta x}\sum_{k=0}^{n}\binom{n}{k}x^k = \sum_{k=0}^{n}C(n,\beta)\binom{n}{k}x^k e^{-\beta x} =$$

$$= \sum_{k=0}^{n}\frac{C(n,\beta)n!x^k e^{-\beta x}}{k!(n-k)!} = \sum_{k=0}^{n}\frac{C(n,\beta)n!\beta^{k+1}x^k e^{-\beta x}}{\beta^{k+1}(n-k)!k!} =$$

$$= \sum_{k=0}^{n}\frac{C(n,\beta)n!}{\beta^{k+1}(n-k)!}\frac{\beta^{k+1}x^k e^{-\beta x}}{k!} =$$

$$= \sum_{k=0}^{n}P(D^n = k+1)\,f_{G^{k+1}}(x) =$$

$$= \sum_{k=1}^{n+1}\frac{C(n,\beta)n!\beta^k x^{k-1}e^{-\beta x}}{\beta^k(n-k+1)!(k-1)!} =$$

$$= \sum_{k=1}^{n+1}\frac{C(n,\beta)n!}{\beta^k(n-k+1)!}\frac{\beta^k x^{k-1}e^{-\beta x}}{\Gamma(k)} = \sum_{k=1}^{n+1}\frac{C(n,\beta)n!}{\beta^k(n-k+1)!}\frac{\beta^k x^{k-1}e^{-\beta x}}{(k-1)!} =$$

$$\sum_{k=1}^{n+1}P(D^n = k)\,f_{G^k}(x).$$

Special cases of $ST1(n,\beta)$ distribution are $ST1(0,\beta) \equiv Exp(\beta)$ and $ST1(1,\beta) \equiv Lindley(\beta).$ The case $n=2$ is introduced in Stoynov (2010) and further generalized in some other publications of the author, for example Stoynov (2011) where Moment Generating Function of $ST1(2,\beta)$ is derived.

As another example we may consider negative binomial distribution for G^k, i. e. $G^k \in NB(k,e^{-\beta}).$ In this case, $\xi \mid D^n \equiv NB(D^n,e^{-\beta})$ and we obtain a distribution which we will call $ST2(n,\beta)$ distribution.

Special cases of $ST2(n,\beta)$ distribution are $ST2(0,\beta) \equiv NB(1,e^{-\beta})$ and $ST2(1,\beta) \equiv \frac{\beta}{\beta+1}NB(1,e^{-\beta}) + \frac{1}{\beta+1}NB(2,e^{-\beta}).$

We say that a random variable ξ has a negative binomial distribution (Pólya distribution) and write this $\xi \in NB(r,p)$, if its probability satisfies

$$P(\xi = k) = \binom{r+k-1}{k}p^r(1-p)^k,\ k = 0,1,2,\ldots$$

We may interpret this random variable as a counter of the failures till the $r-th$ success in a sequence of Bernoulli trials.

As a third example we may consider $G^k \equiv \delta_k(x)$ - random variable which takes value k with probability one. Then $\xi \equiv D^n \in D^n(\beta).$ In this case, we say that random variable ξ has $ST3(n,\beta)$ distribution and denote $\xi \in ST3(n,\beta).$

Special cases of $ST3(n,\beta)$ distribution are $ST3(0,\beta) \equiv D^0 \equiv 1$ and $ST3(1,\beta) \equiv D^1.$

ST(n,β) processes

We say that a process $X(t)$ is $ST1(n,\beta)$ ($ST2(n,\beta)$) and denote this fact $X(t) \in ST1(t;n,\beta)$ ($X(t) \in ST1(t;n,\beta)$), if it has the following properties:

1) $X(0) = 0.$

2) The process has independent increments, i. e. for

$$0 < t_1 < t_2 < \cdots < t_n$$

the random variables

$$X(t_1) - X(0), X(t_2) - X(t_1), \ldots, X(t_n) - X(t_{n-1})$$

are independent.

3) The process is continuous stochastically (continuous in probability), i. e.

$$\lim_{t \to s} X(t) = X(s),$$

where the limit is taken in probability.

4) $X(t)$ is pure jump process with jumps at times $T_{i'}, i = 1,2,\ldots$ and jump sizes $\Delta X(T_i) = 1.$

5) The intervals between two jumps are

$$\tau = T_i - T_{i-1} \in ST1(n-1,\beta)\,(ST2(n-1,\beta)), i = 0,1,\ldots,T_0 = 0$$

The first three conditions mean that $ST1(n,\beta)$ ($ST2(n-1,\beta)$) process is an additive process. If we replace condition 4) with condition

4') $X(t)$ is pure jump process with jumps at times $T_{i'}, i = 1,2,\ldots$ and jump sizes $\Delta X(T_i) = Y_i$, where Y_i are independent and identically distributed random variables,

we say that $X(t)$ is compound $ST1(n,\beta)$ ($ST2(n,\beta)$) process.

It is interesting to see for $ST(n,\beta)$ processes the distribution of the number of jumps till time t which we denote $N^n(t).$

We start with $ST1(n,\beta)$ process. When $X(t) \in ST1(t;n,\beta)$, we consider first the case $X(t) \in ST1(t;1,\beta)$. In this case, $\tau = T_i - T_{i-1} \in ST1(0,\beta) \equiv Exp(\beta), i = 0,1,\ldots,T_0 = 0$. In this case the process $N^1(t)$ is a Poisson process $N(t)$ and for it we have

$$P(N^1(t) = k) = \frac{(\beta t)^k}{k!} e^{-\beta t}.$$

In the case when $X(t) \in ST1(t;n,\beta)$ the intervals between two jumps are

$$\tau = T_i - T_{i-1} \in ST1(n-1,\beta) \equiv Erlang(D^n,\beta), i = 0,1,\ldots,T_0 = 0.$$

First we will consider the case where

$$\tau = T_i - T_{i-1} \in Erlang(n,\beta), i = 0,1,\ldots,T_0 = 0.$$

In this case, we have that the process which counts the jumps of an Erlang process till time t which we denote $N^E(t)$ is a Poisson process $N(t)$ with omitted $n-1$ jumps and actual jumps at every $n-$th jump of the Poison process, so

$$P(N^E(t) = k) = P(N(t) = kn) = \frac{(\beta t)^{kn}}{(kn)!} e^{-\beta t}.$$

So, in the case $X(t) \in ST1(t;n,\beta)$ we have

$$P(N^n(t) = k) = P(N(t) = kn) = \frac{(\beta t)^{kn}}{(kn)!} e^{-\beta t}.$$

Simulation of ST(n,β) distribution

The simulation of $ST(n,\beta)$ distribution and corresponding PMF graphics for different values of the parameters n and β can be done by using R language. Here is the code for creating graphic representation of the PMF (for $n=100$ and $\beta=2$):

```
#ST(n,beta) graphics
beta<-2
n<-100
In_beta<-function(n,beta, recursive=TRUE)
{if (n==0) return (1/beta) else return (1/beta+n/beta*In_beta(n-1,beta))}
Cn_beta<-function(n,beta) {1/In_beta(n,beta)}
STn_beta<-function(x,n,beta){Cn_beta(n,beta)*(1+x)^n*exp(-x*beta)}
m<-10000
STn_beta_values<-0:m
T<-100
tvec<-T*0:m/m
for (i in 1:m) {
        STn_beta_values[i]<-STn_beta(i*T/m,n,beta)
}
freq<-10  # take out every 1000th point in the simulation & plot it
pick<-freq*(0:(m/freq))+1
title<-paste("ST(", round(n,1), ",",round(beta,1), ")")
plot(tvec[pick],STn_beta_values[pick],type='l',xlab="x",ylab="f(x)",main=title,ylim=c(0,0.2))
```

The graphics for the case $n=100$ and $\beta=2$ is given in Fig 1. The graphics for the case $n=40$ and $\beta=2$ is given in Fig 2.

Simulation of ST(n,β) processes

To make simulation of $ST(n,\beta)$ process, the following algorithm can be applied:

1. Define interval $[0,T]$ of the simulation.
2. Set $k=0.$
3. While $\sum_{i=1}^{k}\tau_i < T$ do:

    3.1. Set $k=k+1$

    3.2. Generate $\tau_k \in ST(n-1,\beta).$

    3.3. Set $Y_k=1$ for standard $ST(n,\beta)$ process or simulate Y based on a given distribution f for compound $ST(n,\beta)$ process.

Then the trajectory of $X(t) \in ST(t;n,\beta)$ is given by the formula

$$X(t)=\sum_{i=1}^{N(t)} Y_i,$$

where

$$N(t)=\sum_{i} 1_{\{T_i<T\}}.$$

Here is the code for creating graphic representation of the $ST(n,\beta)$ process:

```
#ST(n+1,beta)_process simulation
# Theta_grid_sets Poisson, Erlang, ST
T<-1000
lambda<-0.1
```

```
Theta_Poisson <-rexp(1,lambda)
while(max(Theta_Poisson)<T) Theta_Poisson <-c(Theta_Poisson,max(Theta_Poisson)+rexp(1,lambda))
m<-length(Theta_Poisson)
Theta_Poisson[m]<-T

# Erlang
beta_ER<-lambda
n_ER<-2
m_ER<-m/n_ER
Theta_ER<- Theta_Poisson[n_ER]
for (i in 2:m_ER)
{
Theta_ER<- c(Theta_ER, Theta_Poisson[i*n_ER])
}


#ST
ST_n<-5
ST_beta<-0.1
n<-20
tvec<-T*0:n/n
In_beta<-function(n,beta, recursive=TRUE)
{if (n==0) return (1/beta) else return ((1/beta)+(n/beta)*In_beta(n-1,beta))}
Cn_beta<-function(n,beta) {1/In_beta(n,beta)}
FDn_inverse<-function(y,n,beta){
Dn_values<-1:(n+1)
Dn_prob<-1:(n+1)
for (i in 1:(n+1))
{
Dn_prob[i]<-(Cn_beta(n,beta)*factorial(n)/(beta^i*factorial(n-i+1)))
}
Prob_acum<-Dn_prob[1]+Dn_prob[2]
for (k in 1:n)
{
if (y< Prob_acum) return (k)
else
Prob_acum<-Prob_acum+Dn_prob[k+2]
}
return(n+1)
}


#Dn_simulation<-function(n,ST_n,ST_beta){
Dn_values<-1:(n+1)
Dn_prob<-1:(n+1)
Dn_simulated<-1:n
for (i in 1:(n+1))
{
Dn_prob[i]<-(Cn_beta(n,ST_beta)*factorial(n)/(ST_beta^i*factorial(n-i+1)))
}
for (i in 1:n)
{
St_unif_value<- runif(1, min = 0, max = 1)
Dn_simulated[i]<-FDn_inverse(St_unif_value,ST_n,ST_beta)
}
acc_ST<- Dn_simulated[1]

Theta_ST<- Theta_Poisson[acc_ST]

while(acc_ST<m)
```

```
{
acc_ST<-(acc_ST+Dn_simulated[i])
if (acc_ST<=m)
Theta_ST<- c(Theta_ST, Theta_Poisson[acc_ST])
}
Theta_ST
s<-8000
tvec<-T*0:s/s
N<-0:s
N[1]<-0
u<-length(Theta_ST)

for (i in 1:s)
{
        N[i]<-0
        for (j in 1:u)
        {
                if ((T*(i-1)/s)> Theta_ST[j]) N[i]<-(N[i]+1)
        }
}
title<-paste("Траектория на ST процес n=",round((ST_n+1),1), ", beta=", round(ST_beta,2))
plot(tvec[1:(s-1)],N[1:(s-1)],type='l', xlab="t",ylab="N(t)", main=title)
```

The graphics of a trajectory of $ST(n,\beta)$ process for the case $n=6$ and $\beta=0.1$ is given in Fig 3.

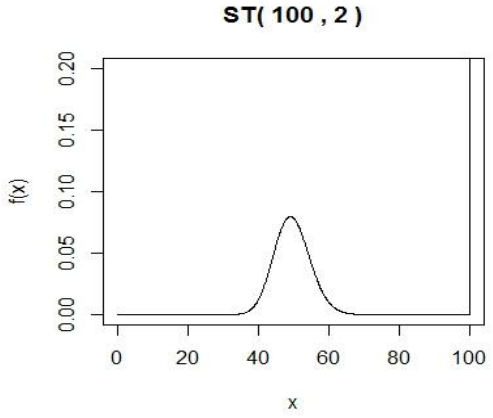


Figure 1. The graphics of $ST(n,\beta)$ distribution for the case $n=100$ and $\beta=2$.

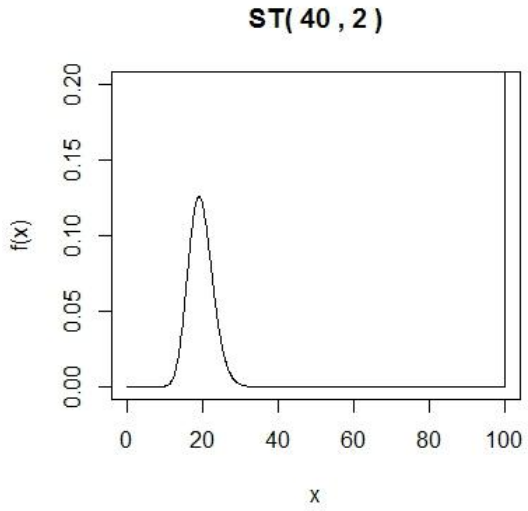


Figure 2. The graphics of $ST(n,\beta)$ distribution for the case $n=40$ and $\beta=2$.

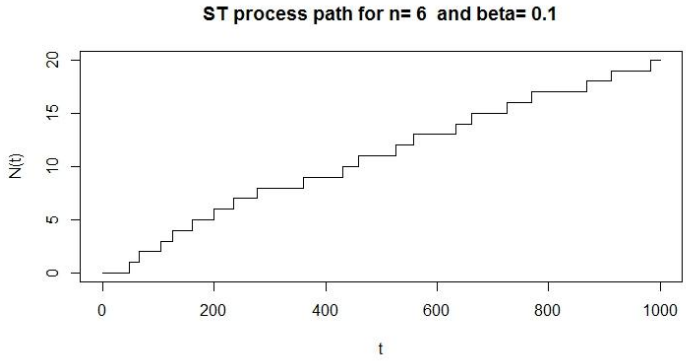


Figure 3. The graphics of a path of $ST(n,\beta)$ process for the case $n=6$ and $\beta=0.1$.

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E-mail marketing with cloud services – an overview

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Abstract.
E-mail marketing is developing very fast in last decade and recently broadly used for offering financial services. It shows low costs and is very powerful marketing tool at the same time. In this article, we consider the e-mail marketing process and some ways of using Python software language to fix some errors in the e-mail list.
Keywords: e-mail marketing; cloud services; SaaS

1. Introduction.

E-mail marketing is developing very fast in last decade. It shows low costs and is very powerful marketing tool at the same time. In this article, we consider the e-mail marketing process and some ways of using Python software language to fix some errors in the e-mail list.

2. Process of e-mail marketing.

The first step of the process is to prepare the sample of addressees. We could find them in Internet, from different address books etc.

After creating the list of addresses, we must ensure that consumer protection laws are followed (for example opt-out should be present in the e-mails sent by e-mail marketing tool).

The next step is to start sending messages periodically ensuring that enough time passes between two consequitive e-mails.

Then a software tool for marketing must be used to send the mails to the recipients automatically. Sendy, for example, is easy-to-use tool, low cost, software as a service (SaaS). The actual sendout of emails, including in the case of Sendy, is straightforward, with very good explanations and engaging user interface which helps out sending the emails in a very easy way

3. Using Python for improving e-mail list.

The programming language Python can be utlised for processing big lists of emails. Imagine a very long list of emails in the following, at first seeming inconvenient format:

```
emailBase = Pavel Stoynov Sofia University email: pavel.t.stoynov@gmail.com assistant
Slavi Slavchev Sofia University email: s_slavchev@feb.uni-sofia.bg PhD candidate
```

Then use some medium-complexity programming code to separate those emails.

With Python having an easy syntax, this task is relatively straightforward, with the help of Google if needed.

```
splitLines = emailBase.split('\n') # records each line
for k in splitLines: # goes through each new line
  if "@" in k: # if you find the @ sign...
    k = k.strip(" \t\n\r") # removes any tabs and surplus spaces
    splitByWhiteSpace = k.split(' ') # splits by space
    for m in splitByWhiteSpace: # considers the new output
      if "@" in m: # if you find the @ sign in this new output
        thisEmail = m # the email is now found
        break # no need to proceed with this line
    print (splitByWhiteSpace[0], "\t", splitByWhiteSpace[1], "\t", thisEmail) # prints the name, surname and email, split by tab
```

Emails often have typos like:

```
John.smith@gmail,com
John.smith@gmail
```

In such cases, again Python can be utilised, with some quick research on Google, to capture wrong emails and potentially not waste the sample.

```
import re  # we tell Python we want to use the so-called Regular Expressions
def validateEmail(email): # start writing a function
  if len(email) > 7:  # it is unlikely an email is less than 7 characters
    if re.match("^.+\\@(\\[?)[a-zA-Z0-9\\-\\.]+\\.([a-zA-Z]{2,3}|[0-9]{1,3})(\\]?)$", email) != None:  # use an email validator
      return 1  # if the email is valid then we say "1" (true)
  return 0  # otherwise we say "0" (false)
for k in emails:  # iterate through each email
  if validateEmail(k)==0:  # if the email is not valid
    print(k)  # then print it
```

This task can usually be done by the email sendout tool itself, usually with the bounce-back report (if an email fails to be sent, it marks it as invalid). If there is no built-in email validator beforehand, there are disadvantages:

- You only realise the emails are invalid once already sent, which means amending them and resending the email – and this is double work
- Usually a separate campaign needs to be done which means the report stats will be skewed

Another proofreading guideline which can be checked is the correct domains. For example this email address seems valid at first:

```
Hanns.gass@raiffaisen.de
```

but if we look closely we'll see that raiffeisen is misspelt. We can use a plain built-in console program (available in various operation systems) - in the Windows case, CMD:

```
ping raiffaisen.de
Ping request could not find host raiffaisen.de. Please check the name and try again.
```

Either with Python or with Excel (or other manner) we can find all distinct domain names and check them before uploading the sample file – again beneficial for better planning of the sample.

4. Conclusion.

E-mail marketing becomes more and more popular. With the available software tools for e-mail marketing it becomes easy to use and very effective way of dowing marketing in web.

Upgrades of accounting software for different industries. Two case studies.

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Abstract.
Recently companies started using holistic software tools for running their business. The tools used are updates of usual accounting software including the business processes typical for the corresponding business areas. In this article, two such cases are considered – software tools for building industry and recovery residencies management.

Keywords: software; building industries; recovery residencies

1. Introduction.

Recently companies started using holistic software tools for running their business. The tools used are updates of usual accounting software including the business processes typical for the corresponding business areas. In this article, two such cases are considered – software tools for building industry and recovery residencies management.

2. Creating software for building industry.

Building companies work in a strongly competitive environment. Using appropriate software give them possibilities to rise efficiency and cut the cost. The cloud services themselves enhance efficiency and decrease the costs even more. At the same time the use of mobile devices gives the possibility even field work teams to have a constant access to the software system.

Creating software for building industry starts with research on how building companies do their business.

The preparation includes also intelligence about the existing software tools for building company. For example, two big building software vendors are RunJob and BuildIT. It is good to make a detailed review of their features. Other cloud services for building industries also should be analysed to determine the most viable entities.

To study the satisfaction of the users of such software tools, some on-line surveys can be used. For example, the free online tool *itqlick* compares software products to meet the requirements most optimally.

A more detailed survey could be done using a cloud email marketing tool (for example, Sendy).

The review selects the best realized features of each and every software tool. For example, typical features of BuildIT are:

- CAD import/export
- automation
- GD&T (geometric dimensioning and tolerancing) evaluations
- multi-device capability
- customized reports
- real-time feedback.

Another tool, RunJobs, is web based construction project management software is simple, affordable and powerful.

3. Creating software for recovery residences.

Recovery residencies becomes more and more popular in USA. Thousands of recovery residences houses exist organized in state and federal associations. There are different type of houses, with different pattern of stay and daily routines.

There is a need of software tools for managing recovery residencies. To create such a software, all business activities related to keeping recovery residencies should be analised and corresponding algorithms should be created and after that implemented.

The ontology of this area could include as agents: recovery rsidences owners, recovery residences hosts/howsekeepers, patients, regulators, doctors/ medical personal.

4. Conclusions.

Software for building industry – cloud based and developed for mobile phones will improve considerably field work in building industry. There are already several good products for automatization of field work in building.

Software for recovery residences is a perspective market niche. Automatization of recovery residences keeping should have economic impact and also impact on patient recovery process.

Analysis of war-related risks – case study of Syrian civil war

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Abstract.
Local military conflicts are prominent issue in today's world. The paper applies systematic and some other approaches to war-related risks in a specific case – Syrian civil war.
Keywords: war-related risks; civil war

Introduction

Local military conflicts are prominent issue in today's world. They raise many security issues not only in the countries where they arise but also in their neighbors, in the regions where the countries are located and even for global security. Her we consider a case of local conflict – recent civil war in Syria which is still ongoing.

The Syrian civil war is a multi-sided armed conflict in Syria in which international interventions have taken place. The war grew out of an unrest of the 2011 and is now being fought among several fractions receiving substantial support from foreign actors. Because of foreign involvement, many researchers label the conflict a proxy war.

Methodology

The main approach of the study is the systematic approach. Systematic approach considers the security as a system of interrelated elements – treats (and possibilities), resources for defense (and attack), security actors (organizations participating in the conflicts), security products (which in case of war are actually the defense and attack of each party and defense/attack developing with time). These elements can be considered from the perspective of different parts of the reality: nature, economy, policy, social life, resulting in different aspects of the security – ecological, economical, political, social, cultural.

A model of security system (Stoynov, 2016) is presented at Figure 1.

SECURITY SYSTEM								
		SOCIETY		POLICY		ECONOMY		ENVIRONMENT
Security Manage-ment		Social security manage-ment through social security policies and programs	↔	Internal and external security management through internal and external state policy	↔	Economic security management through economic security policies	↔	Ecological security management through environmental policies and programs
		↕		↕		↕		↕
Security Resources		People, Social groups	↔	State with central and local administration, specialized security organizations (army, police,…)	↔	National economy and economic resources with security use	↔	Relief, climate, waters, food
		↕		↕		↕		↕
Exposures		Life, personal values, human	↔	Sovereignty, territorial integrity, rule-based	↔	Sustainable growth, employment, financial	↔	Air, water, soils, biodiversity

		rights		international system, national values, public safety		stability; stability of supply, positive balance, guaranteed export, reserves		
		↕		↕		↕		↕
Security Products		Social security system	↔	Internal and external security, activities of the specialized security organizations (army, police,…)	↔	Military sector of economy, security products, security services	↔	Readiness system for protecting public safety form natural hazards
		↕		↕		↕		↕
Risks		Social risks	↔	Political violence and military treats	↔	Internal and external economic risks	↔	Natural hazards

Figure 1. Proposed model of security system. Source: Stoynov(2016).

In this paper, mainly political (and specifically military) as well as some social aspect of the Syrian civil war are considered.

For analyzing different elements of the security system in the context of the Syrian civil war, different additional methods are used: historical approach - for tracking the development of the conflict, game-theory approach - for identifying involved parties, statistical data analysis - for identifying the risks and the resources for dealing with these risks.

Syrian civil war – the actors

The key internal political actors are: Syrian Government, Democratic opposition, Army of conquest, ISIL, Kurds. Every political actor has its military sub-actors.

As of February 2016 the government held 40% of territory and 66% of the population. ISIL controls 20-40% of territory, 20% of territory controlled by rebel groups and other 15-20% are held by Kurds. In Figure 2 current territory distribution among the key players is presented.

The Syrian government enjoys high levels of support in certain areas under its control - according to a poll organized by British ORB International, up to 73% of the population in government-controlled areas support the government effort.

The main armed forces of Syrian government include Syrian Armed Forces (178 000) and National Defense Forces (100 000).

Before the uprising and war broke out, Syrian Armed Forces was estimated at 325 000 regular troops and also approximately 280 000–300 000 reservists. Since June 2011, defections of soldiers have been reported.

The Syrian National Defense Force (NDF) was formed out of pro-government militias. They receive their salaries, and their military equipment from the government. The force acts in an infantry role, directly fighting against rebels on the ground and running operations in coordination with the army.

Syrian Government receives support by external allies: Russia 4000 and 1000 contractors (since 2015), Hezbollah 6000-8000 (since 2013), Iran 3000-5000 (since 2013).

According to independent analysts, by the beginning of 2014, approximately 500 Hezbollah fighters had died in the Syrian conflict.

Since the start of the civil war, Iran has expressed its support for the Syrian government and has provided it with financial, technical, and military support.

On 30 September 2015, Russia's Federation Council unanimously granted permission for use of the Russian Armed Forces in Syria.

The armed forces of Syrian Democratic opposition include Free Syrian Army -FSA (40 000- 50 000), Southern Front (from 2014), Fatah Halab (25 000-32 000) (from 2015), Islamic Front 40 000-70 000 (2013-2015).

Formation of FSA was announced on 29 July 2011 by a group of defecting Syrian Army officers. The FSA functions more as an umbrella organization than a traditional military chain of command, and was first based its head office in Turkey, but moved its command headquarters to northern Syria.

The Islamic Front is a merger of seven rebel groups involved in the Syrian civil war that was announced on 22 November 2013. The group is widely seen as backed and armed by Saudi Arabia.

The armed forces of Syrian Democratic opposition receive also help by external allies like Turkey as well as from other countries: Saudi Arabia, Qatar, France, United States.

The armed forces of Army of conquest include: Al Nusra 13 000 (since July 2016 Jabhat Hateh Al Sham), Ahrar Al Sham, Turkistan Islamic Party of Syria.

The al-Qaeda-linked al-Nusra Front, being the biggest jihadist group in Syria, is often considered to be the most aggressive and violent part of the opposition.

In the east, the Islamic State of Iraq and the Levant (ISIL), a jihadist militant group originating from Iraq, made rapid military gains in both Syria and Iraq.

The armed forces of ISIL (31 500-100 000) include Military and Khalid Ibn Al Walid Army.

The armed forces of Kurds include mainly YPG and SDF (57 000 – 60 000), Syrian Arab Coalition (4000), MFS. Its allies are IFB, PKK. They also receive support by Russia and Iraqi Kurdistan.

YPG was the first military organization of Kurds. Kurds – mostly Sunni Muslims, with a small minority of Yezidis – represented 10% of Syria's population at the start of the uprising in 2011.

SDF are an alliance of Arab, Assyrians, Armenian, Kurdish, and Turkmen militias fighting for a democratic and federalist Syria. They are opposed to the Assad regime, but have directed most of their efforts against Al-Nusra Front and ISIL. The group formed in December 2015, led primarily by the predominantly Kurdish People's Protection Units (YPG). On 17 March 2016 the Syrian Democratic Council, the political wing of the SDF, declared the creation of an autonomous federation in northern Syria.

A number of countries, including many NATO members, participate in the Combined Joint Task Force, chiefly to fight ISIL and support rebel groups perceived as moderate and friendly to Western nations such as the Free Syrian Army. Those who have conducted airstrikes in Syria include the United States, Australia, Bahrain, Canada, France, Jordan, The Netherlands, Saudi Arabia, Turkey, the United Arab Emirates and the United Kingdom.

Turkey has been accused of fighting against Kurdish forces in Syria and Iraq, including intelligence collaborations with ISIL in some cases.

Formed on 23 August 2011, the National Council is a coalition of anti-government groups, based in Turkey. The National Council seeks the end of Bashar al-Assad's rule and the establishment of a modern, civil, democratic state.

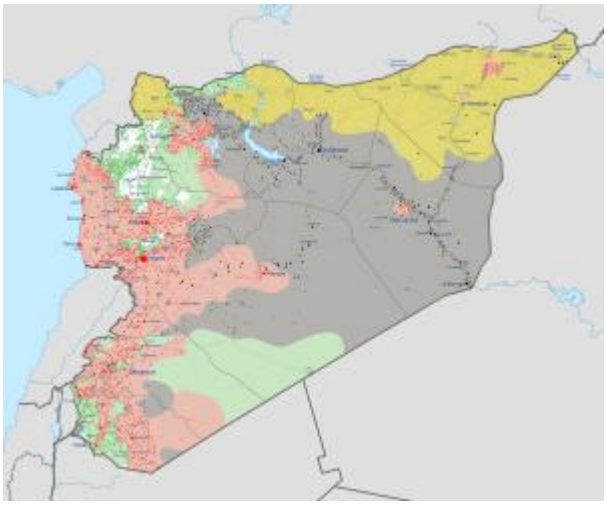


Figure 2. Territory distribution among the key players about the end of 2016. Yellow: Kurds. Red: Government. Green: Moderate opposition. Grey: ISIS. White: Al Nusra Front. Source: Syrian Civil War – Wikipedia (2016)

On 11 November 2012 in Doha, the National Council and other opposition groups united as the National Coalition for Syrian Revolutionary and Opposition Forces. The following day, it was recognized as the legitimate government of Syria by numerous Persian Gulf states.

Syrian civil war – historic approach

The protests began on 15 March 2011 when protesters marched in the capital of Damascus, demanding democratic reforms and the release of political prisoners. Fire was open on the protesters by unknown men. President Bashar al-Assad blamed foreign conspirators pushing Israeli propaganda for the protests.

On 29 July 2011, seven defecting Syrian officers formed the Free Syrian Army (FSA), composed of defected Syrian Armed Forces officers and soldiers. On 23 August, a coalition of anti-government groups called the Syrian National Congress was formed. The council, based in Turkey, attempted to organize the opposition.

In December 2011, USA, UK and France started deploying instructors, weapons (mainly for Muammar Gaddafi's arsenals) and volunteers from the Libyan Transitional National Council at Turkish military bases close to the Syrian border.

On 6 September 2012 Kurdish activists reported that 21 civilians were killed near Allepo. In a statement released shortly after the deaths, the Kurdish People's Protection Units (YPG) vowed to retaliate. A few days later, Kurdish forces killed 3 soldiers in Afin and captured a number of other government soldiers in Kobani and Al-Malikiyah from where they drove the remaining government security forces.

Starting on 5 June 2014 , ISIL seized swathes of territory in Iraq in addition to heavy weapons and equipment from the Iraqi Army, some of which they brought into Syria. On 19 August, 2014, American journalist James Foley was executed by ISIL in retaliation for the United States operations in Iraq. American jets began bombing ISIL in Syria on 23 September 2014. Foreign partners participating in the strikes with the United States were Bahrain, Saudi Arabia, the United Arab Emirates, Qatar, Jordan and Australia.

On 30 September 2015, at an official request by the Syrian government headed by President Bashar al-Assad, the Russian Aerospace Forces began a sustained campaign of air strikes against both ISIL and the anti-Assad FSA.

On 8 October 2015, the U.S. officially announced the end of the Pentagon's $500 million program to train and equip Syrian rebels in an acknowledgment that the program had failed (other covert and significantly larger CIA programs to arm anti-government fighters in Syria continue).

In mid-November 2015, in the wake of the Russian plane bombing over Sinai and the Paris attacks, both Russia and France significantly intensified their strikes in Syria, France closely coordinating with the U.S. military.

At the end of July 2016, the fighting between the government and Islamist rebels in and around Aleppo intensified. On 24 August 2016, Turkey′s armed forces invaded Syria in the Jarablus area controlled by ISIL starting what the Turkish president called the Operation Euphrates Shield, aimed against, according to his statement, both the IS and Kurdish ″terror groups that threaten our country in northern Syria″.

Syrian civil war – economic resources involved

Both the Syrian government and the opposition have received support, militarily and diplomatically, from foreign countries leading the conflict to often be described as a proxy war.

The major parties supporting the Syrian Government are Iran and Hezbollah. Both of these are involved in the war politically and logistically by providing military equipment, training and battle troops. The Syrian government has also received arms and support from Russia

The main Syrian opposition body – the Syrian coalition – receives political, logistic and military support from the United States, Britain and France. CIA operatives and U.S. special operations troops have trained and armed nearly 10,000 rebel fighters at a cost of $1 billion a year since 2012.

The Syrian coalition also receives logistic and political support from Sunni states, most notably Turkey, Qatar and Saudi Arabia. The Financial Times and The Independent reported that Qatar had funded the Syrian rebellion by as much as $3 billion.

It is estimated ISIL has sold oil for between $1 000 000 and $ 4000 000 per day principally to Turkish buyers, during at least six months in 2013, greatly helping its growth. The Turkish government has been also accused of helping ISIL by turning a blind eye to illegal transfers of weapons, fighters, oil and pillaged antiquities across the southern border.

On the other hand, initial refusal from the West to support the Syrian liberal opposition has contributed to the emergence of extremist Sunni groups. These include ISIL and the Nusra Front, linked to al-Qaeda.

Syrian civil war – risks and treats

With porous borders with most of its neighbors, the fighting has spilled across them, sparking fears of a regional war which is the most important political risk related to Syrian civil war.

In June 2014, members of the Islamic State of Iraq and the Levant (ISIL) crossed the border from Syria into northern Iraq, and have taken control of large swaths of Iraqi territory as the Iraqi Army abandoned its positions.

The Syrian civil war has led to incidents of sectarian violence in northern Lebanon between supporters and opponents of the Syrian government, and armed clashes between Sunnis and Alawites in Tripoli. Fighting between rebels and government forces has spilled into Lebanon on several occasions.

The fight between ISIL and the Kurds in the town of Kobani on the Turkish border has led to rioting throughout Turkey and to brief occupations of a number of parliament buildings in Western Europe.

The waves of migrants create political and social tension in the countries of Middle East and Europe.

The economic treats are related to the huge economical loses. Whole cities in Syria are destroyed in large extent and the Syrian economy is in collapse. The conflict holds the record for the largest sum ever requested by UN agencies for a single humanitarian emergency—$6 500 000 000 worth of requests of December 2013.

The social risks are related to lost lives, migration, poverty, diseases.

Estimates of deaths in the conflict vary widely, with figures, per opposition activist groups, ranging from 140,200 to 470,000. Some areas of the country have been affected disproportionately by the war; by some estimates, as many as a third of all deaths have occurred in the city of Homs.

On 20 August 2014, a new U.N. study concluded that at least 191 690 people have died in the Syrian conflict. The UN thereafter stopped collecting statistics, but a study by the Syrian Centre for Policy Research released in February 2016 estimated the death toll at 470 000, with 1 900 000 wounded (reaching a total of 11.5% of the entire population wounded or killed).



Figure 3. Total deaths over the course of the conflict in Syria (18 March 2011 – 18 October 2013). Source: Wikipedia (2016).

Formerly rare infectious diseases have spread in rebel-held areas brought on by poor sanitation and deteriorating living conditions.

The violence in Syria has caused millions to flee their homes. As of March 2015, Al-Jazeera estimates 10 900 000 Syrians, or almost half the population, have been displaced. 3 800 000 have been made refugees.

According to various human rights organizations and United Nations, human rights violations have been committed by both the government and the rebels, ISIS forces have been accused by UN of using public executions, amputations and lashings in a campaign to instill fear. Criminal networks have been used by both the government and the opposition during the conflict.

As of March 2015, the war has affected 290 heritage sites, severely damaged 104, and completely destroyed 24. Five of the six UNESCO World Heritage Sites in Syria have been damaged. UNESCO listed all six Syria's World Heritage sites as endangered but direct assessment of damage is not possible.

The international humanitarian response to the conflict in Syria is coordinated by the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) in accordance with General Assembly Resolution 46/182. The primary framework for this coordination is the Syria Humanitarian Assistance Response Plan (SHARP) which appealed for USD $1 410 000 000 to meet the humanitarian needs of Syrians affected by the conflict.

Conclusion

In Syrian civil war, not only the internal political forces are involved but also the also Syria’s border countries, regional countries and Global powers.

Regional power supporting Government is Iran. Government is also supported by Hezbollah organization.

The rest of countries and organizations in the region, including both the Arab League and the Organization of Islamic Cooperation who suspended Syria's membership, support the opposition.

Among the Global powers European Union and many Western governments expressed support for the opposition while Russia and China support Syrian Government.

Because of these opposite interests, the only right way for stopping the conflict is the negotiation between all concerned parties. This Negotiation could be performed as soon as possible to achieve stable peace in the country and in the region.

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