



Metrum Research Group LLC  
Phone: 860.735.7043  
billg@metrumrg.com

2 Tunxis Road, Suite 112  
Tariffville, CT 06081  
www.metrurnrg.com

# Torsten

## Refactor

Notes  
(Torsten Version 0.84, Stan version 2.17.1)

February 2018

## Contents

Chapter 1. Major components	3
1. PKEventList	3
2. PKSolver	3
3. PKPopulation	3
Chapter 2. PKModel	5
1. Implementation	5
Chapter 3. PKSystem	7



## CHAPTER 1

# Major components

### 1. PKEventList

List of PK events as provided by NONMEM, not necessarily ordered, hence refrain using "history" in name.

It describes PK and is facing users. It evolves when Stan provides more friendly types such as tuples.

Example:

time	amt	rate	ii	evid	cmt	addl	ss
...							

- **PKSystem**: PK parameters as a 1-1 mapping to an ODE system.

### 2. PKSolver

A **PKSolver** iterates through **PKSystem** to solve the ODE using various solution methods.

It solves ODE and is facing developers.

It is orthogonal to **PKSystem**.

Could be several things:

**Named**. For built-in models

**Matrix exp**. For linear ODE model and built-in.

**Numerical integration**. For all kinds of **PKModel**.

### 3. PKPopulation

A list of **PKSystem**.



## CHAPTER 2

## PKModel

A `PKModel` is what utilizes parameters in `PKSystem` to describe a PK system, e.g. 2-cpt model. It *is* ODE and is facing developers.

Could be several things:

- Named: For built-in models such as 1-cpt, 2-cpt, etc.
- Matrix: For linear ODE model
- Functor: For general ODE model

A `PKModel` is orthogonal to `PKEventList`.

## 1. Implementation

```
template<class... Ts>
struct PKModel {
    // ...
}
```



## CHAPTER 3

### PKSystem

PK parameters as a 1-1 mapping to an ODE system, consisting of `PKModel` and corresponding parameters, ordered in time. It consumes `tlag` & `rate` data to re-order and augment the event history. It also incorporates `ModelParameterHistory`.

It describes ODE and is facing developers & power users.

Example:

```
time parameters(theta, rate, biovar) PKModel
...
```

`parameters` can be backed by `std::tuple` so that it is a combination of data and `var`, improving MCMC efficiency.