Getting Started with SsfPack 3

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1 Introduction

SsfPack is a suite of routines that allows *Ox* programs to carry out computations involving the statistical analysis of univariate and multivariate models in the linear Gaussian state space form. *SsfPack* allows for a full range of different state space forms: from a simple time-invariant model to a complicated time-varying model.

The documentation for Ssfpack is provided in:

- Koopman, S.J., N. Shephard and J.A. Doornik (1999) Statistical algorithms for models in state space using SsfPack 2.2 *Econometrics Journal*, 1999, **2**, p.113-166.

  See `doc/SsfPackV22.pdf`.

- Koopman, S.J., N. Shephard and J.A. Doornik (2008) *SsfPack 3.0: Statistical algorithms for models in state space*, London: Timberlake Consultants Ltd.

2 SsfPack 3 versions

There are two versions of SsfPack 3:

- **SsfPack Basic**

  This provides the basic functionality, as discussed in Koopman, S.J., N. Shephard and J.A. Doornik (1999).

- **SsfPack Extended**

  This is the professional version of *SsfPack*. The *SsfPack Extended* version includes the functionality of the *SsfPack Basic* version. In addition to that, it contains algorithms that are computationally more efficient, and allows for exact treatment of the diffuse conditions for the initial state vector.

Table 1 provides a detailed comparison of the two versions.

	SsfPack Basic	*SsfPack Extended*
Free for academic use only	√	
Includes book		√
Available from Timberlake Consultants		√
Basic examples	√	√
Extended examples		√
Windows (32-bit)	√	√
Windows (64-bit)		√
OS X	√	√
Linux (32-bit)	√	√
Linux (64-bit)	√	√
Other platforms on request		√
AddSsfReg	√	√
GetSsfArma	√	√
GetSsfReg	√	√
GetSsfSpline	√	√
GetSsfStsm	√	√
KalmanFil	√	√
KalmanSmo	√	√
SimSmoDraw	√	√
SimSmoWgt	√	√
SsfAbout	√	√
SsfCondDens	√	√
SsfLik	√	√
SsfLikConc	√	√
SsfLikSco	√	√
SsfMomentEst	√	√
SsfRecursion	√	√
SsfVersion	√	√
SsfWarning	√	√
SsfWeights	√	√
GetSsfSarima		√
KalmanFilEx		√
KalmanFilMeanEx		√
KalmanFilSmoMeanEx		√
KalmanInit		√
KalmanSmoEx		√
KalmanSmoMeanEx		√
SsfBootstrap		√
SsfCondDensEx		√
SsfForecast		√
SsfFreqGain		√
SsfLikConcEx		√
SsfLikEx		√
SsfLikMulti		√
SsfLikScoEx		√
SsfMomentEstEx		√
SsfMomentEstMulti		√
SsfSignalEst		√
SsfSimObs		√
SsfSimState		√
SsfWeightsEx		√

Table 1: Comparison of functionality between *SsfPack Basic* and *SsfPack Extended.*

3 SsfPack Extended Installation

3.1 Windows Vista, Windows XP, Windows 2000

First ensure that Ox Professional is installed.

Insert the SsfPack CD. If Autorun is on, the installation program is started automatically. Otherwise start `ssfpackex300.exe` from the root folder of the CD.

By default, installation is to `C:\Program Files\OxMetrics5` (or your language-specific location for program files). You may choose another location for the `OxMetrics5` folder, but the selected folder must hold the Ox tree (by default, Ox would be in installed into `C:\Program Files\OxMetrics5\ox`).

3.2 Windows Vista 64-bit, Windows XP x64

First ensure that Ox Professional (64-bit) is installed.

All 64-bit Windows components are in the `x64` folder of the SsfPack CD.

Insert the SsfPack CD. If Autorun is on, the installation program is started automatically. Otherwise start `x64\ssfpackex300_64.exe` from the CD.

By default, installation is to `C:\Program Files\OxMetrics5` (or your language-specific location for program files). You may choose another location for the `OxMetrics5` folder, but the selected folder must hold the Ox tree (by default, Ox would be in installed into `C:\Program Files\OxMetrics5\ox`).

3.3 OS X and Linux

First ensure that Ox Professional is installed.
SsfPack Extended is provided as a zip-file archive.
Installation steps:

1. Unzip `ssfpack_ex_30.zip` (or a newer version if available) to the `ox/packages` folder. The default packages folder of Ox is:

   - **OS X 10.5 (Leopard), 10.4 (Tiger)**
     `/Applications/OxMetrics5/ox/packages/`
     Move the `ssfpack` folder created by extracting the zip file to this `ox/packages` folder, to create the `ox/packages/ssfpack` folder. Your administrative password will be required to complete this action.
   - **Linux 32-bit**, **Linux 64-bit**
     `/usr/share/OxMetrics5/ox/packages/`
     Put the zip file in `ox/packages/` and unzip from there, maintaining the folder structure. This will create the `ox/packages/ssfpack` folder, and should be done as root or superuser.

2. Check that there now is a `packages/ssfpack` folder in your `ox` folder which holds `ssfpack_ex.h` (among other files).

The zip file contains the dynamic-link library for several platforms:

- `ssfpackex.so` - Linux 32-bit

- `ssfpackex_64.so` - Linux 64-bit
- `ssfpackex_osx.so` - OS X

Ox will automatically use the correct version.

4 SsfPack Basic Installation

Pre-requisites

1. First install Ox Console or Ox Professional (see www.doornik.com or www.timberlake.co.uk).
2. Download SsfPack Basic from www.ssfpack.com.

Installation steps:

1. Put `ssfpack_basic_30.zip` (or a newer version if available) in the `ox/packages` folder, and unzip from there. The default packages folder of Ox is:

   - **Windows Vista, Windows XP, Windows 2000**
     `C:\Program Files\OxMetrics5\ox\packages`
     Put the zip file in your `ox\packages` folder and unzip from there, maintaining the folder structure. This will create the `ox/packages/ssfpack` folder.
   - **OS X 10.5 (Leopard), 10.4 (Tiger)**
     `/Applications/OxMetrics5/ox/packages/`
     Move the `ssfpack` folder created by extracting the zip file to this `ox/packages` folder, to create the `ox/packages/ssfpack` folder. Your administrative password will be required to complete this action.
   - **Linux 32-bit**, **Linux 64-bit**
     `/usr/share/OxMetrics5/ox/packages/`
     Put the zip file in `ox/packages/` and unzip from there, maintaining the folder structure. This will create the `ox/packages/ssfpack` folder, and should be done as root or superuser.

2. Check that there now is a `ox/packages/ssfpack` folder in your `ox` folder which holds `ssfpack.h` (among other files).

The zip file contains the dynamic-link library for several platforms:

- `ssfpack.dll` - Windows 32-bit
- `ssfpack.so` - Linux 32-bit
- `ssfpack_64.so` - Linux 64-bit
- `ssfpack_osx.so` - OS X

Ox will automatically use the correct version.

5 SsfPack folder structure

The OxMetrics folder structure is as follows:

```
\Program Files\               (default)
    OxMetrics5\               Root of OxMetrics 5
        ox\                   Root of Ox installation
            packages\         Ox packages
                ssfpack\      SsfPack libraries and headers
                    code\     SsfPack Basic example Ox code
                    code_ex\  SsfPack Extended example Ox code
                    doc\      Koopman, Shephard, Doornik (1999) and
                              this document.
```

6 Using SSfPack Extended

Insert the following line:

```
#include <packages/ssfpack/ssfpack_ex.h>
```

at the top of any Ox file that uses *SsfPack Extended.*

Run any of the examples in `ox/packages/ssfpack/code_ex` or `ox/packages/ssfpack/code` to try *SsfPack Extended*, by loading the Ox file into OxMetrics and running it.

The `code_ex/ssfsupport.ox` program is a good one to start with.

7 Using SSfPack Basic

Insert the following line:

```
#include <packages/ssfpack/ssfpack.h>
```

at the top of any Ox file that uses *SsfPack Basic.*

Run any of the examples in `ox/packages/ssfpack/code` to try *SsfPack Basic*, by loading the Ox file into OxMetrics or OxEdit and running it. The `code/ssfsupport.ox` program is a good one to start with.

Note that many example programs create graphs. These cannot be displayed when using Ox Console.