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SURAT PERNYATAAN

Nomor: 144/SP.HCP/LPPM/UNIJA/IV/2023

Yang bertanda tangan di bawah ini :

Nama : Dr. Habibi, M.Pd
Jabatan : Sekertaris LPPM
Instansi : Universitas Wiraraja

Menyatakan bahwa :

1. Nama : Dr. Anik Anekawati, M.Si.
   Jabatan : Dosen Fakultas Keguruan dan Ilmu Pendidikan
2. Nama : Syaifurrahman Hidayat, S.Kep., Ns., M.Kep.
   Jabatan : Dosen Fakultas Ilmu Kesehatan
3. Nama : Mohammad Rofik, SE, M.SE
   Jabatan : Dosen Fakultas Ekonomi dan Bisnis

Telah melakukan cek plagiarisme ke LPPM menggunakan *software turnitin.com* untuk HKI dengan judul ***"Aplikasi Pemrograman matlab untuk pemodelan spatial autoregressive model (SAR-SEM) dan Spatial Error Model Pada Structural Equation Modeling (SERM-SEM) "*** dan mendapatkan hasil similarity sebesar 1%

Demikian surat pernyataan ini dibuat untuk digunakan dengan sebaik-baiknya.

Sumenep, 08 April 2023
Sekertaris LPPM,

Dr. Habibi, M.Pd.
NIDN. 0725018001

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HKI aplikasi Pemprograman

by Anik Anekawati

Submission date: 08-Apr-2023 10:46AM (UTC+0700)
Submission ID: 2058817448
File name: emrograman_Pemodelan_SAR-SEM_dan_SERM-SEM_Menggunakan_MatLab.pdf (13.03M)
Word count: 7520
Character count: 44389

Aplikasi Pemrograman Matlab untuk pemodelan Spatial Autoregressive Model (SAR-SEM) dan Spatial Error Model pada Structural Equation Modeling (SERM-SEM)

Penyusun :

Anik Anekawati

Syaifurrahman Hidayat

Mohammad Rofik

Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia

Universitas Wiraraja

2022

Aplikasi Pemrograman Matlab untuk pemodelan Spatial Autoregressive Model (SAR-SEM) dan Spatial Error Model pada Structural Equation Modeling (SERM-SEM)

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Universitas Wiraraja
2022

KATA PENGANTAR

Puji syukur kehadirat Allah SWT yang telah melimpahkan rahmat, nikmat dan petunjuk-Nya sehingga "***Aplikasi Pemrograman Matlab untuk Pemodelan Spatial Autoregressive Model* (SAR-SEM) *dan Spatial Error Model pada Structural Equation Modeling* (SERM-SEM)**" ini telah dapat diselesaikan.

Aplikasi Pemrograman Matlab untuk Pemodelan *Spatial Autoregressive Model* (SAR-SEM) dan *Spatial Error Model* pada *Structural Equation Modeling* (SERM-SEM) merupakan bahasa pemrograman menggunakan *software* Matlab. Matlab (MATriks LABoratory) merupakan suatu software atau alat bantu komputasi untuk pemrograman dalam perhitungan dan analisis yang banyak digunakan dalam semua area penerapan matematika dan statistika.

Pada aplikasi ini telah dibuat program untuk menghitung hasil estimasi variabel laten eksogen dan endogen menggunakan metode *weighted least squares* (WLS), menduga parameter model SAR-SEM menggunakan metode *two stage least square* (2SLS), menduga parameter model SERM-SEM menggunakan metode *generalized method of moment* (GMM), uji dependensi spasial menggunakan uji *Lagrange Multiplier* (LM), dan pengujian parameter secara simultan menggunakan *maximum likelihood ratio test* (MLRT).

Penyusun menyampaikan terima kasih kepada semua pihak yang ikut serta dalam penyusunan aplikasi ini. Ucapan terima kasih juga disampaikan kepada Direktorat Jenderal Pendidikan Tinggi, Riset, dan Teknologi cq. Direktorat Riset, Teknologi, dan Pengabdian Kepada Masyarakat (DRTPM) atas bantuan pendanaan melalui skema hibah Penelitian Dasar Kompetitif Nasional (PDKN) dengan nomor kontrak 159/E5/P6.02.00.PT/2022; dan nomor kontrak turuan 159/E5/P6.02.00.PT/2022, 001/SP2H/PEN-DRPM/SK-PDKN/LPPM/UNIJA/V/2022.

Penyusun menyadari masih banyak kekurangan sehingga membutuhkan masukan, kritik dan saran untuk penyempurnaan selanjutnya. Semua korespondensi dapat dilakukan dengan email anik@wiraraja.ac.id.

September 2022

Tim Penulis

DAFTAR ISI

I. Model, Metode dan Asumsi-asumsi pada Pemodelan SAR-SEM dan SERM-SEM

Berikut adalah penjelasan model, indeks, dan asumsi-asumsi yang harus dipenuhi dalam menjalankan aplikasi pemrograman pemodelan SAR-SEM dan SERM-SEM

1. Model pengukuran dari SEM

$$\underset{Ax1}{\mathbf{x}} = \underset{Axp}{\mathbf{\Lambda_x}}\ \underset{px1}{\boldsymbol{\xi}} + \underset{Ax1}{\boldsymbol{\delta}^*}, \text{dimana } \boldsymbol{\delta}^* \sim N\left(\mathbf{0}, \mathbf{\Theta}_{\delta}\right)$$

$$\underset{Bx1}{\mathbf{y}} = \underset{Bxq}{\mathbf{\Lambda_y}}\ \underset{qx1}{\boldsymbol{\eta}} + \underset{Bx1}{\boldsymbol{\varepsilon}^*}, \text{dimana } \boldsymbol{\varepsilon}^* \sim N\left(\mathbf{0}, \mathbf{\Theta}_{\varepsilon^*}\right)$$

2. Model SAR-SEM

$$\underset{Tx1}{\boldsymbol{l}} = \underset{Tx(p+1)}{\boldsymbol{K}}\ \underset{(p+1)x1}{\boldsymbol{\beta}} + \lambda \underset{TxT}{\mathbf{W}}\ \underset{Tx1}{\boldsymbol{l}} + \underset{Tx1}{\boldsymbol{\varepsilon}}$$

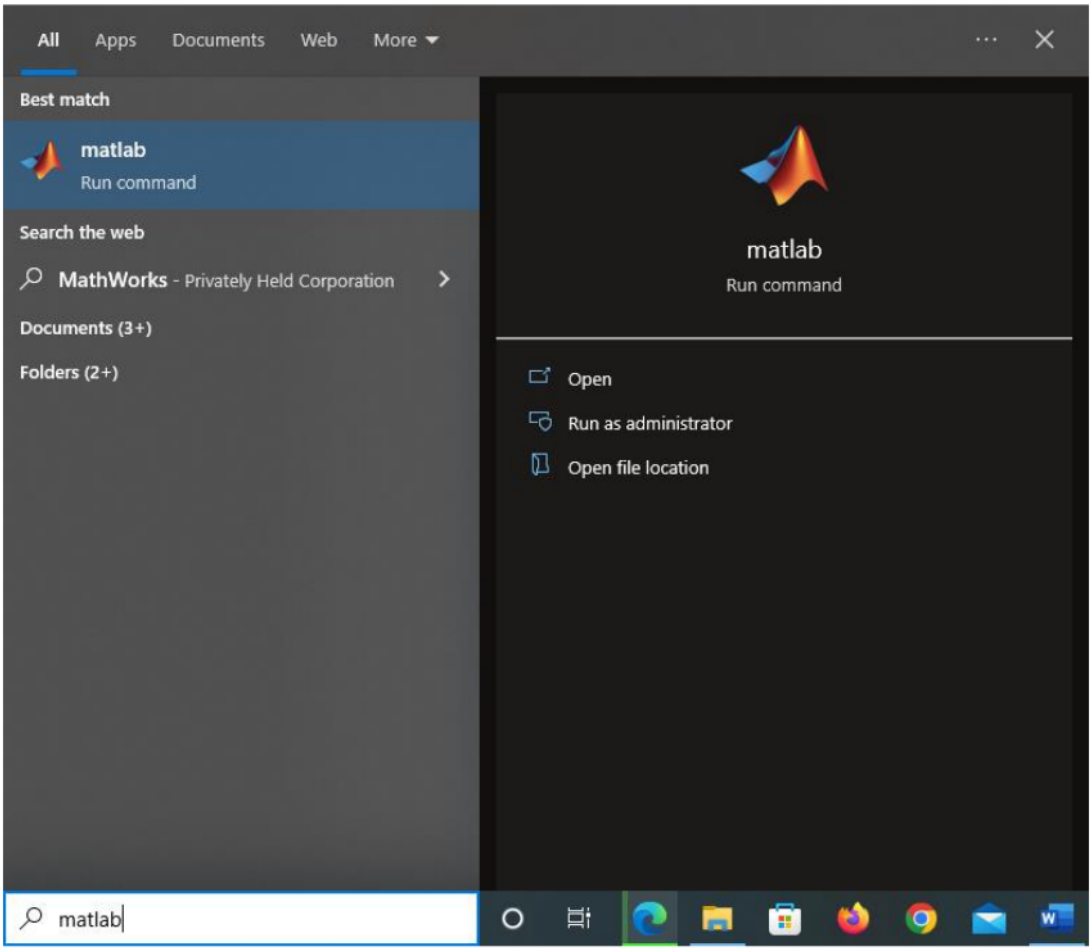
3. Model SERM-SEM

$$\underset{Tx1}{\boldsymbol{l}} = \underset{Tx(p+1)}{\boldsymbol{K}}\ \underset{(p+1)x1}{\boldsymbol{\beta}} + \left(\underset{TxT}{\mathbf{I}} - \rho \underset{TxT}{\mathbf{W}}\right)^{-1} \underset{Tx1}{\boldsymbol{\varepsilon}}$$

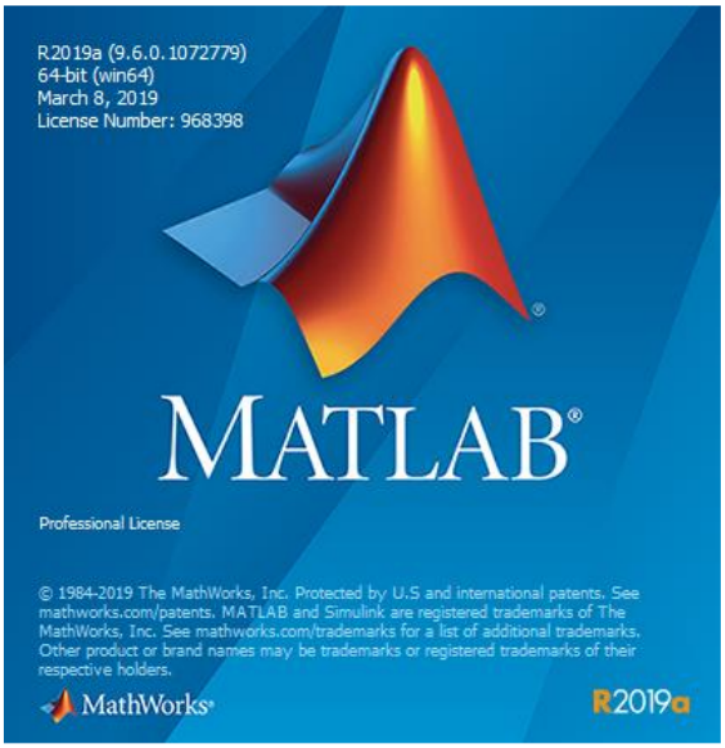
4. Asumsi-asumsi
   a. Nilai *loading* faktor $\mathbf{\Lambda_x}$, $\mathbf{\Lambda_y}$, matrik varian *error* $\mathbf{\Theta}_{\delta}$, dan $\mathbf{\Theta}_{\varepsilon^*}$ adalah konstan.
   b. Matrik bobot spasial $\mathbf{W}_T = \mathbf{M}_T$.
   c. Semua elemen diagonal matrik bobot spasial $\mathbf{W}_T$ adalah nol.
   d. Matrik $\left(\mathbf{I} - \lambda \mathbf{W}_T\right)$ dan $\left(\mathbf{I} - \rho \mathbf{W}_T\right)$ adalah nonsingular dengan $|\lambda| < 1$ dan $|\rho| < 1$.
   e. ε_i berdistribusi identik (bersifat independen).
   f. Bersifat linier dalam variabel.
   g. Catatan indeks: A=jumlah seluruh indikator variabel laten eksogen; B=jumlah seluruh indikator variabel laten endogen; T=jumlah sampel; p=banyaknya variabel laten eksogen; q=banyaknya variabel laten endogen (dalam hal ini adalah 1)
5. Pada aplikasi ini menggunakan dua cara tempat penulisan script pemrograman, yaitu Graphical User Interface (GUI) Matlab dan M-File Matlab
6. Masing-masing cara tersebut memuat proses input data, menghitung skor faktor baik eksogen, maupun endogen menggunakan metode WLS, mengestimasi parameter dari model SAR-SEM menggunakan metode 2SLS dan SERM-SEM menggunakan metode GMM, pengujian dependensi spasial model SAR-SEM dan SERM-SEM menggunakan uji Lagrange Multiplier, serta pengujian parameter secara simultan menggunakan metode MLRT.

II. Tata Cara Menjalankan GUI untuk Aplikasi Pemodelan SAR-SEM dan SERM-SEM

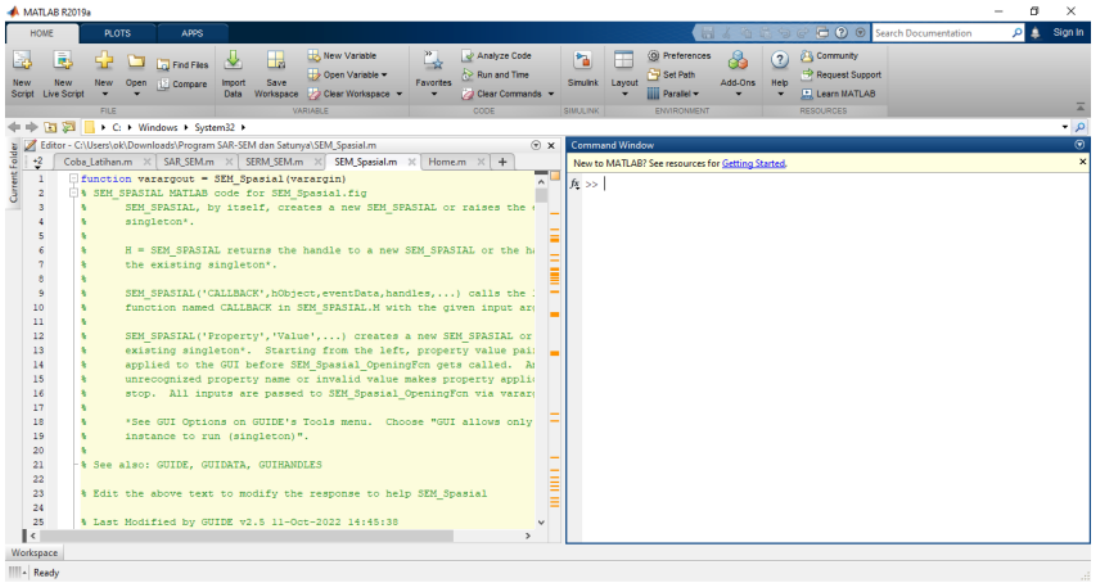
1. Buka aplikasi Matlab lewat menu jendela laptop/PC



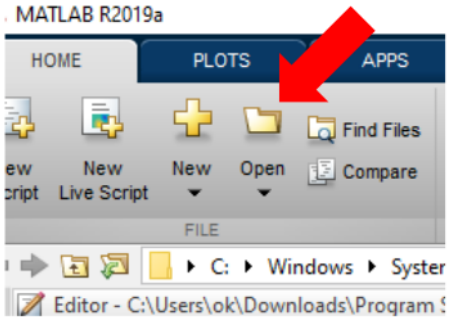
2. Hasil dari membuka Matlab



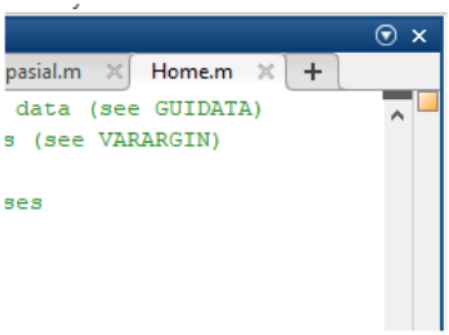
3. Tampilan ketika file Matlab terbuka pertama kali



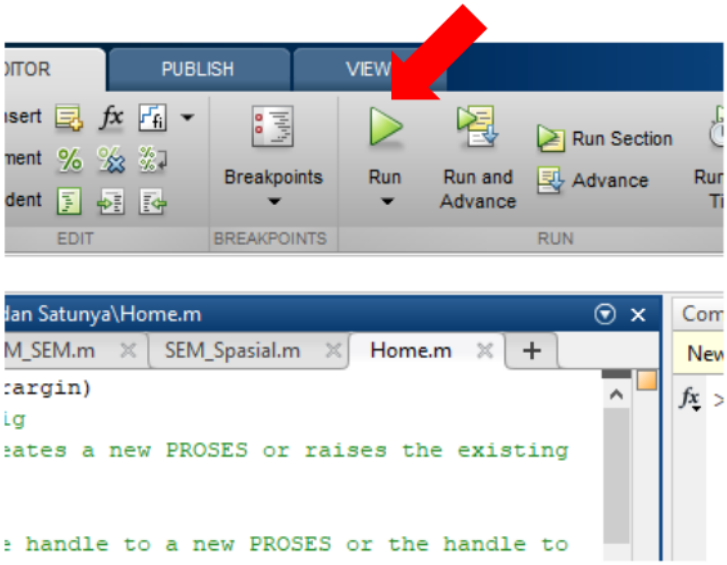
4. Kemudian klik open di toolbar Matlab



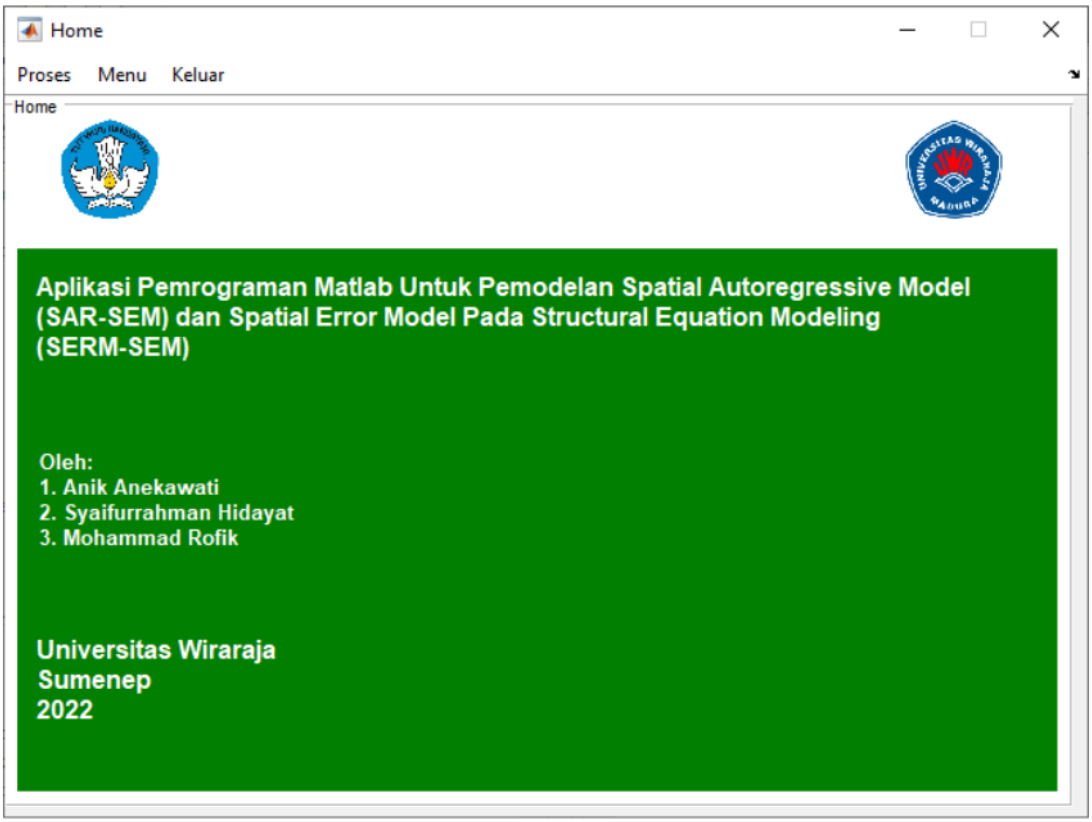
5. Buka M-File atau script yang bernama Home.m yang tampilannya sebagai berikut:



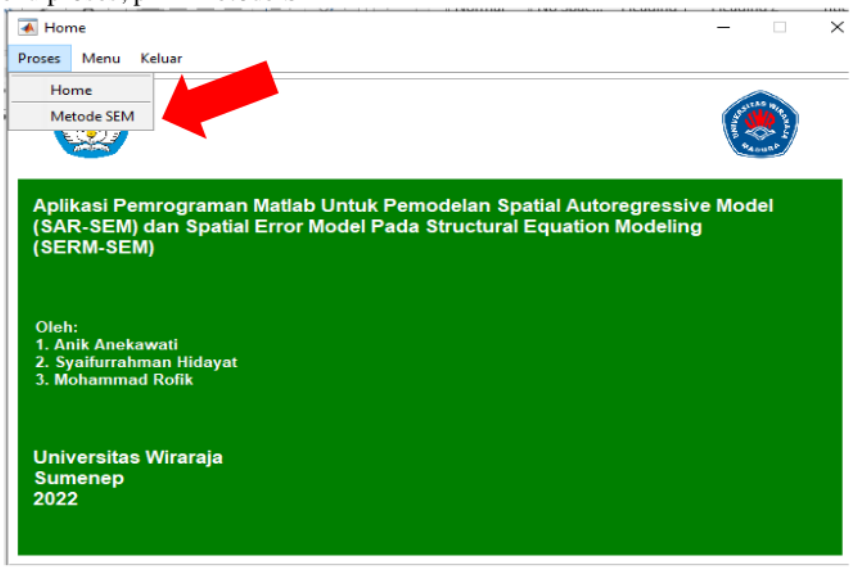
6. Kemudian lakukan run proses



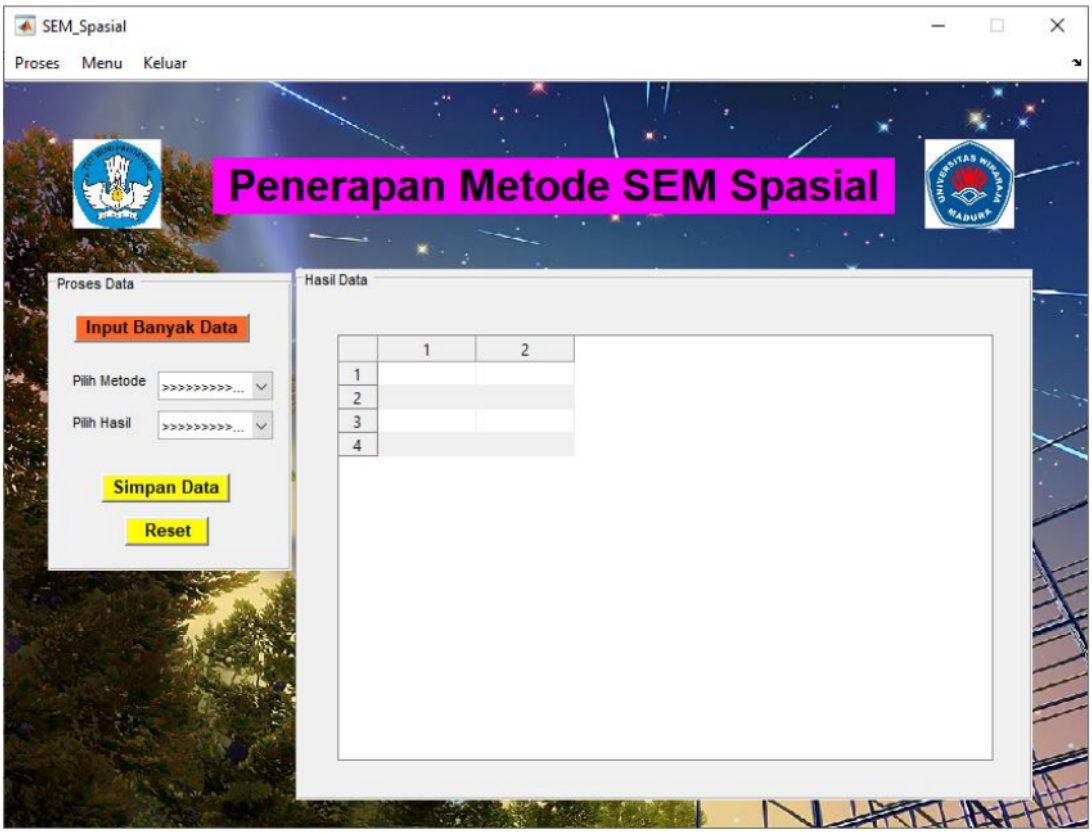
7. Langkah selanjutnya tampil halaman awal seperti gambar berikut



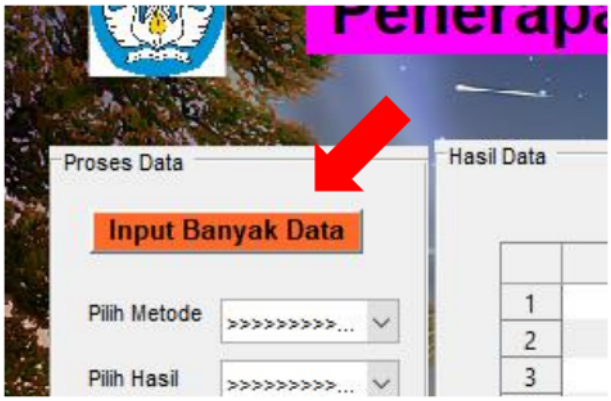
8. Dalam menu proses, pilih Metode SEM



9. Kemudian masuk ke GUI aplikasi SEM Spasial

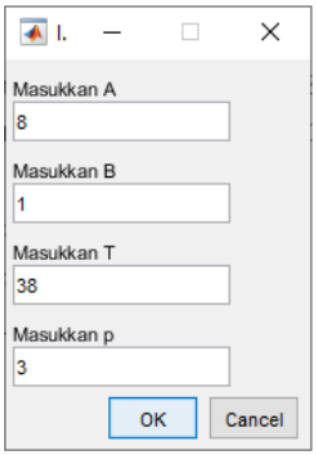


10. Kemudian klik Input Banyak Data



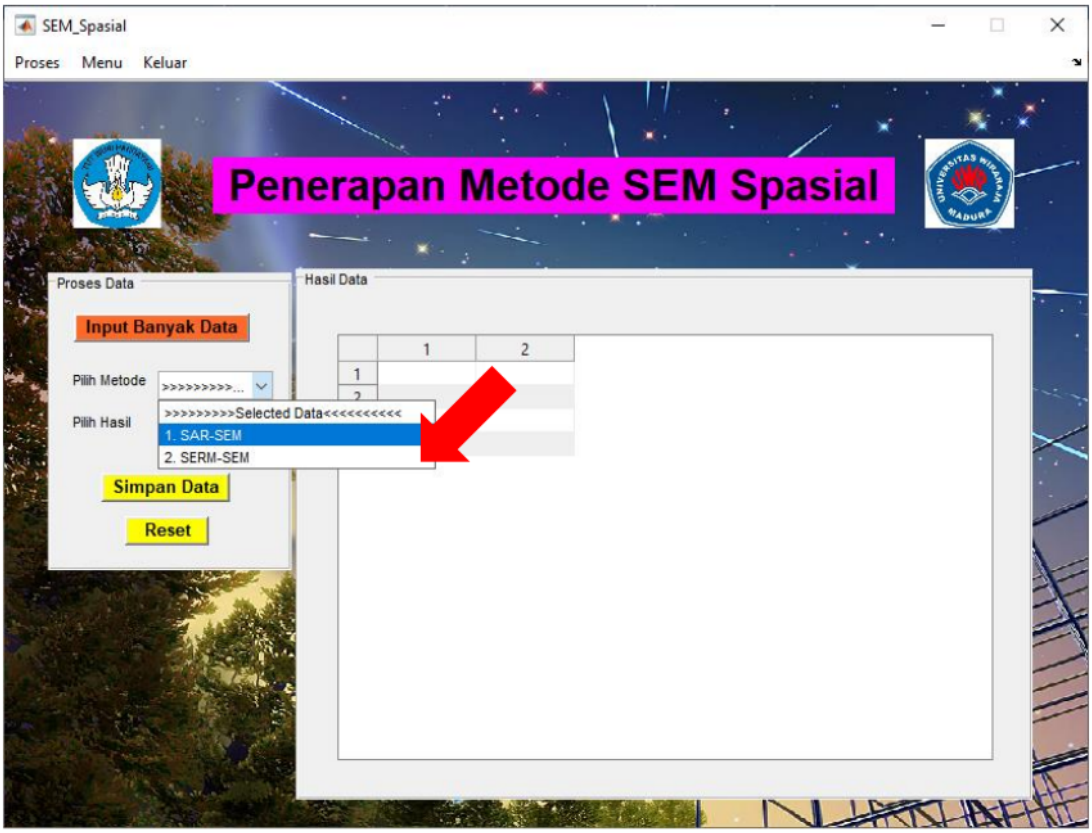
11. Hasil dari Input Banyak Data sebagai berikut

A=jumlah seluruh indikator variabel laten eksogen; B=jumlah seluruh indikator variabel laten endogen; T=jumlah sampel; p=banyaknya variabel laten eksogen

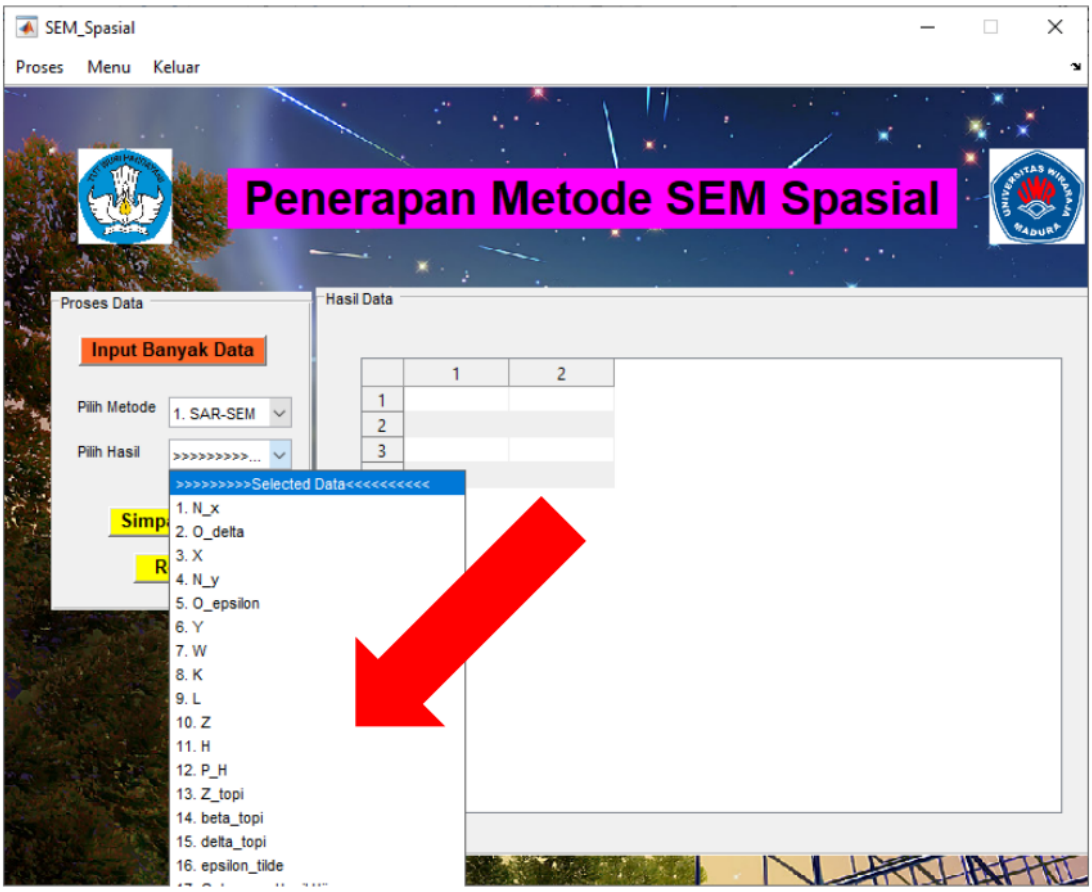


Kemudian lanjutkan input data masing-masing variabel masukan

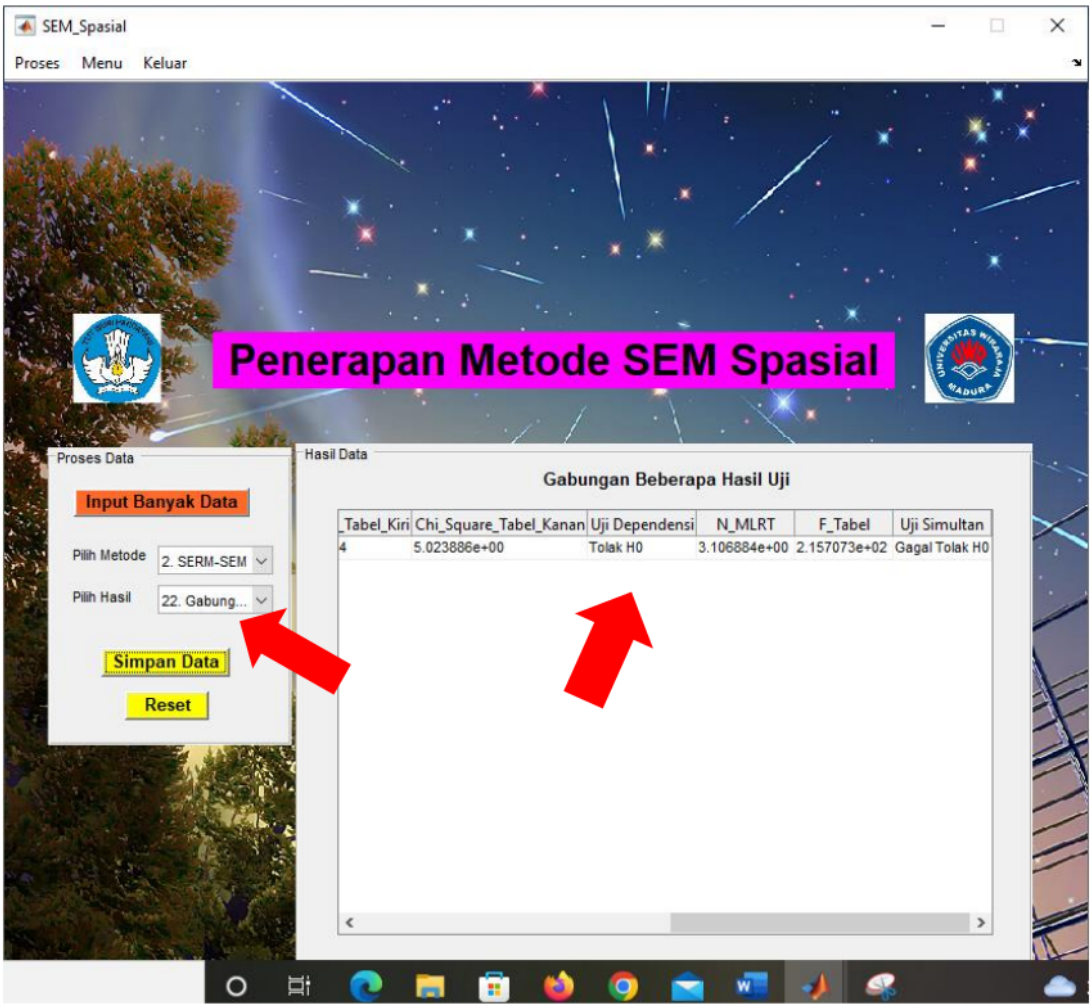
12. Kemudian pilih metode SEM Spasial (seperti SAR-SEM atau SERM-SEM)



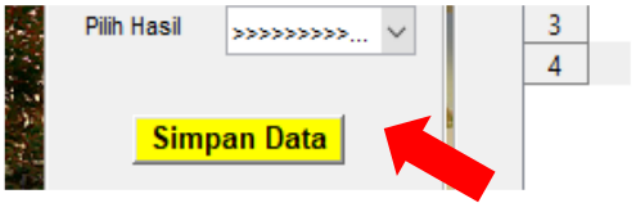
13. Pilih hasil yang diinginkan



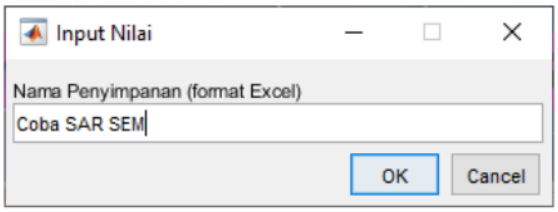
14. Misal klik no. 17 Gabungan Hasil Uji diperoleh hasil sebagai berikut



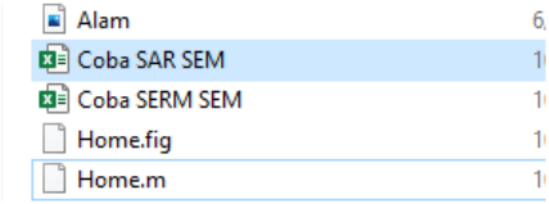
15. Kemudian hasil bisa disimpan ke dalam bentuk Excel



16. Setelah diklik Simpan Data, beri nama penyimpanan



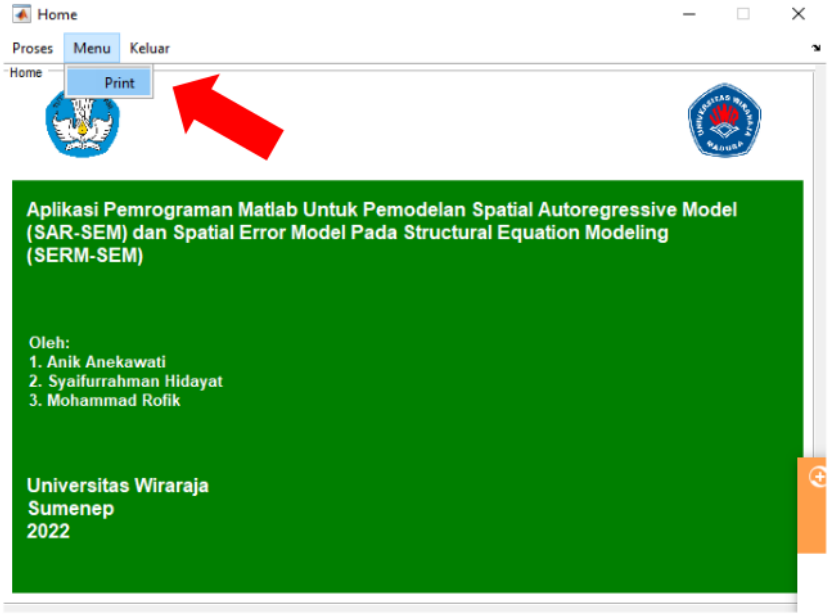
17. Hasil penyimpanan MS. Excel



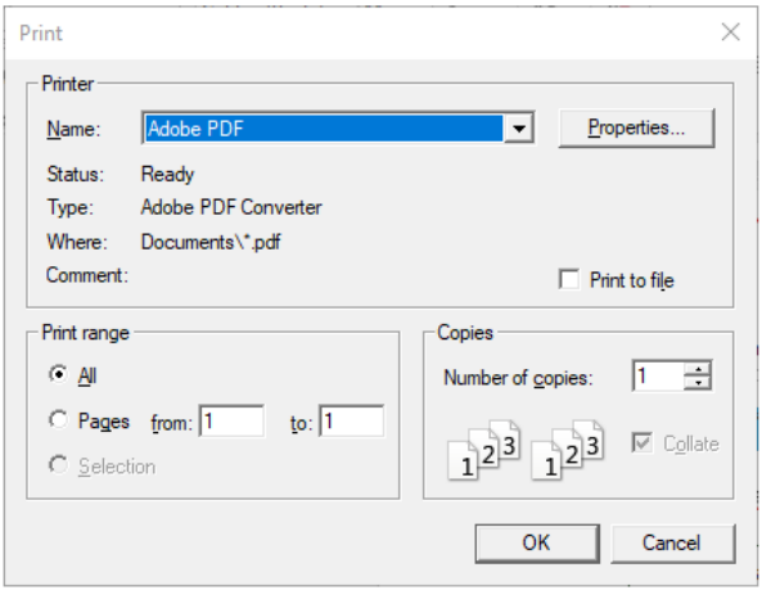
18. Hasil di GUI bisa di Reset ulang

19. Jika ingin kembali ke Home pilih Proses dan klik Home

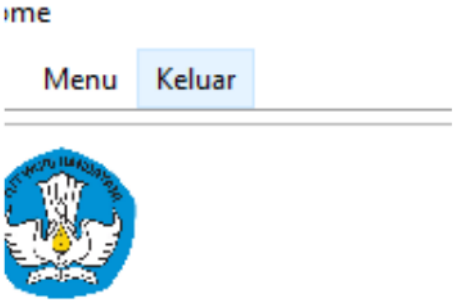
20. Jika klik Menu, maka muncul pilihan Print untuk mencetak hasil atau GUI yang dibuat.



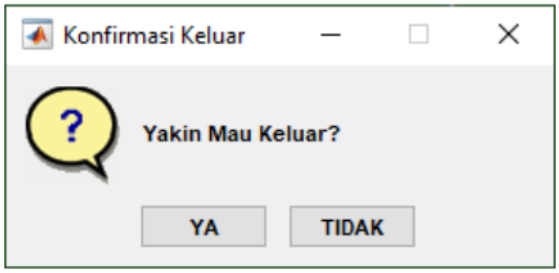
21. Hasil tampilan untuk di print



22. Jika ingin keluar, tekan menu Keluar

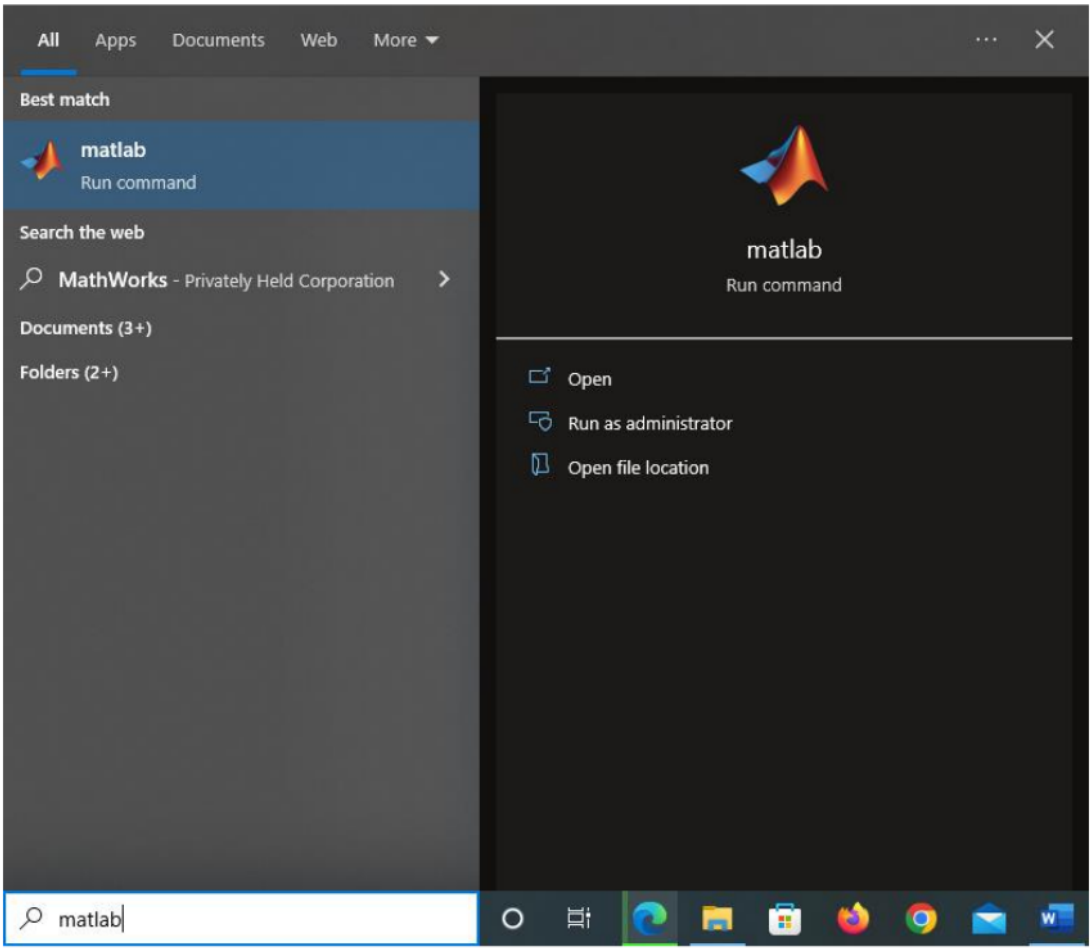


23. Hasil tampilan menu Keluar, tinggal pilih Ya jika ingin keluar, pilih Tidak jika tidak ingin keluar proses

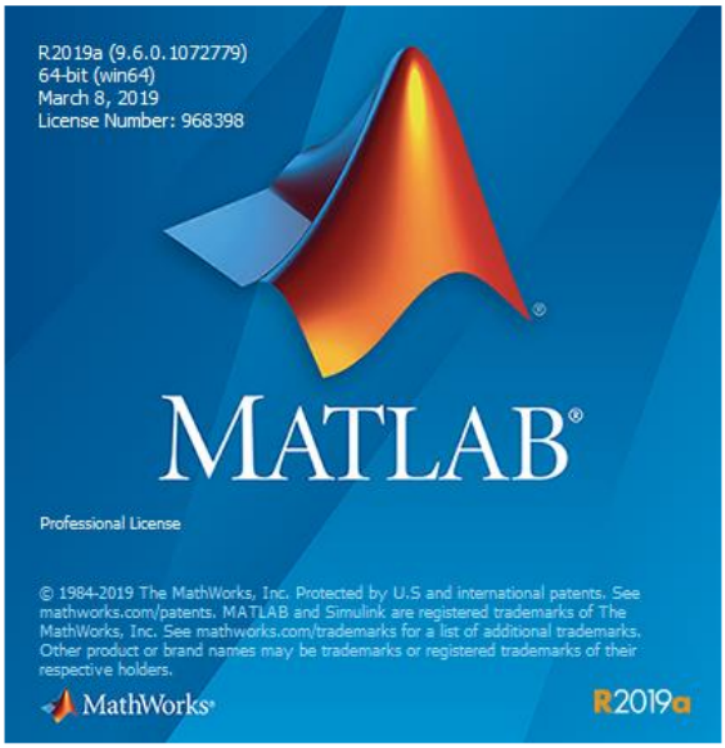


III. Tata Cara Menjalankan M-File untuk Aplikasi Pemodelan SAR-SEM dan SERM-SEM

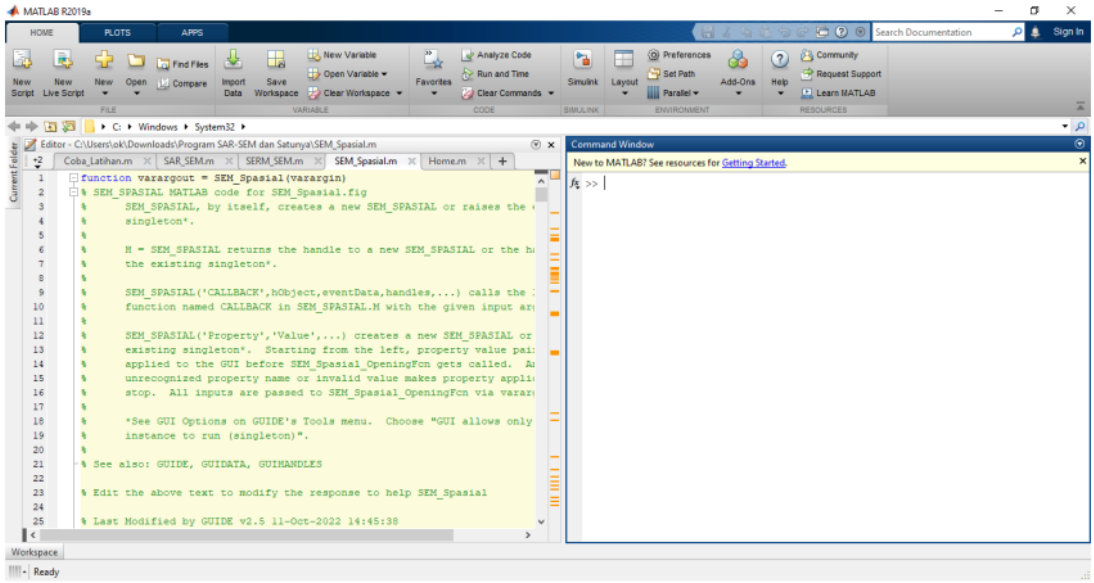
1. Buka aplikasi Matlab lewat menu jendela laptop



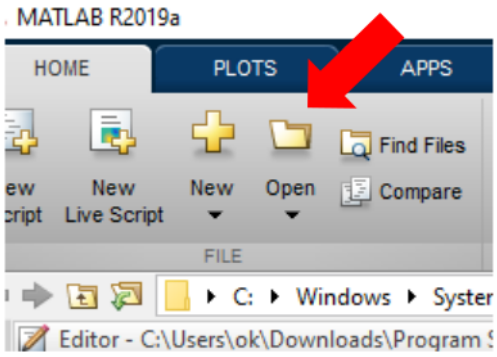
2. Hasil dari membuka Matlab



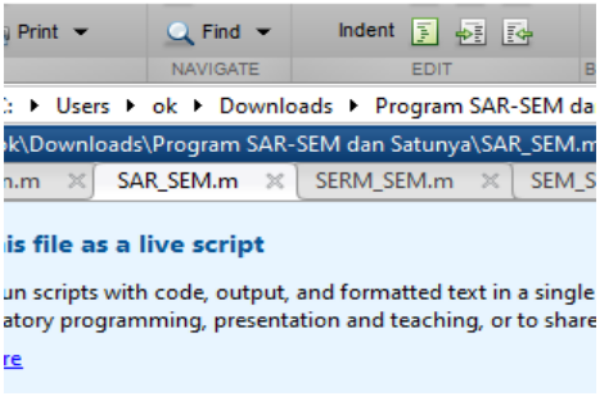
3. Tampilan ketika file Matlab terbuka pertama kali



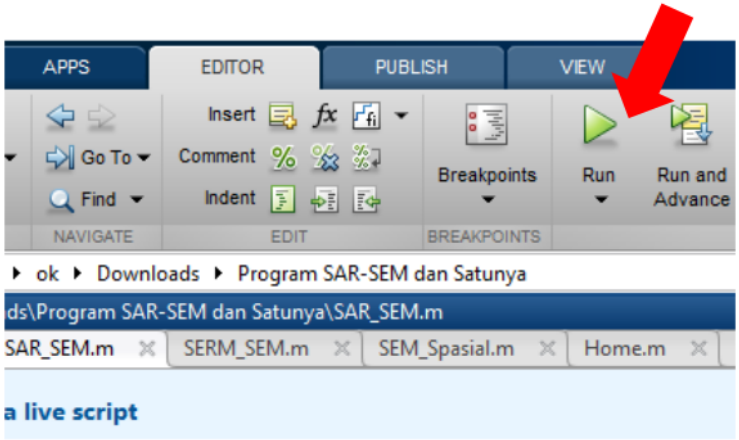
4. Kemudian klik open di toolbar Matlab



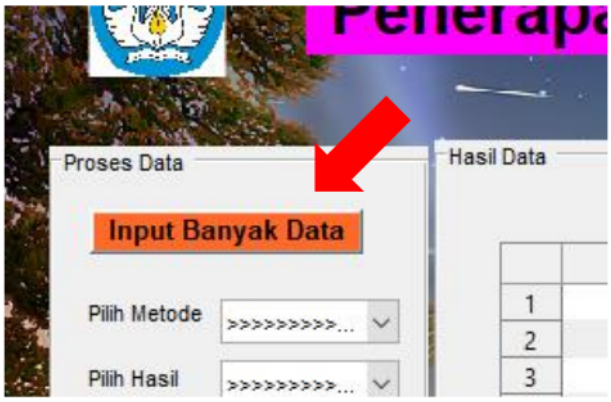
5. Buka M-File atau script yang bernama SAR_SEM.m atau SERM_SEM.m yang tampilannya sebagai berikut:



6. Kemudian lakukan proses running

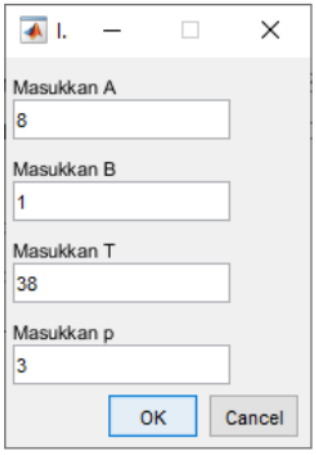


7. Kemudian klik Input Banyak Data



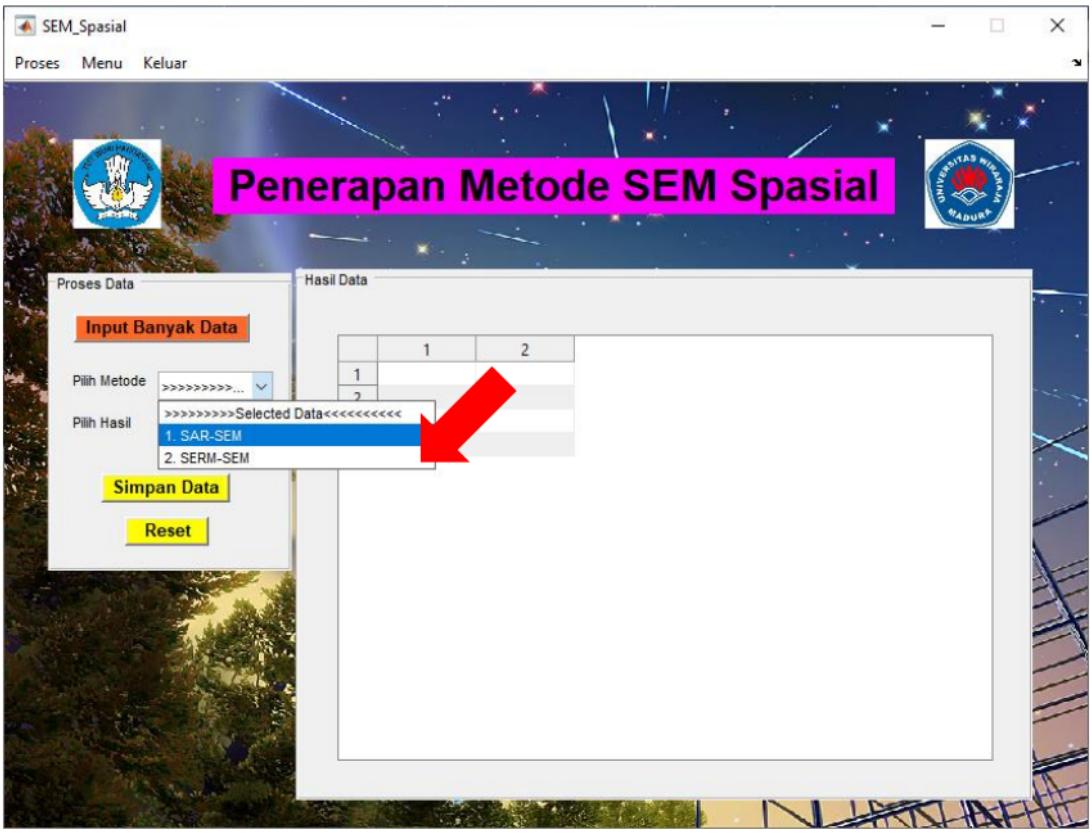
8. Hasil dari Input Banyak Data sebagai berikut

A=jumlah seluruh indikator variabel laten eksogen; B=jumlah seluruh indikator variabel laten endogen; T=jumlah sampel; p=banyaknya variabel laten eksogen

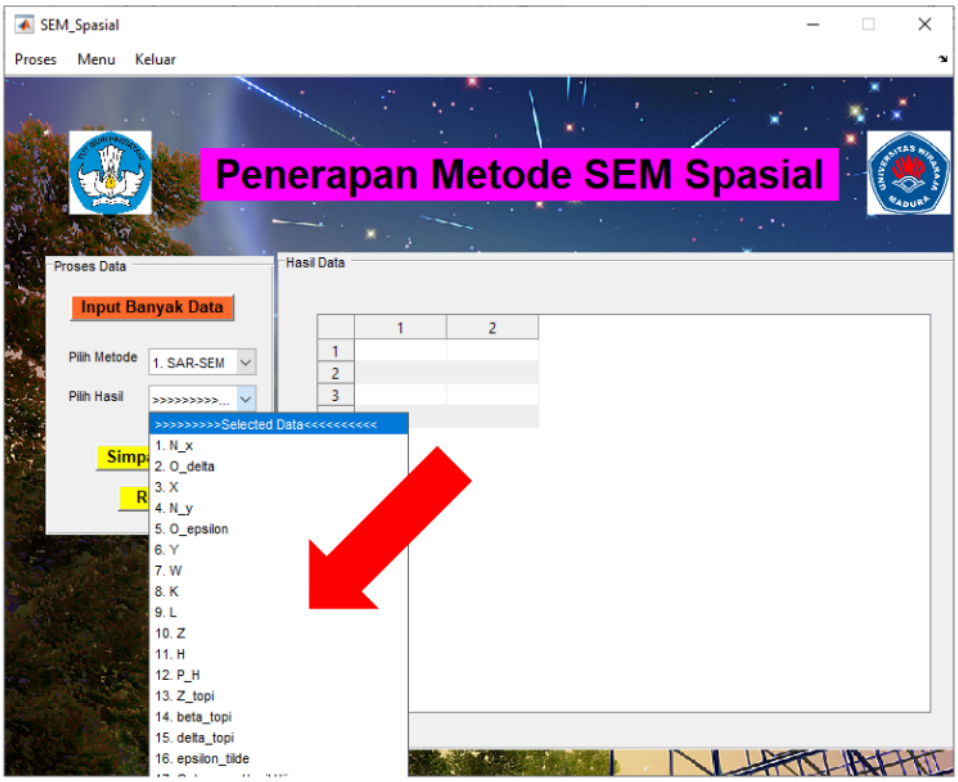


Kemudian lanjutkan input data masing-masing variabel masukan

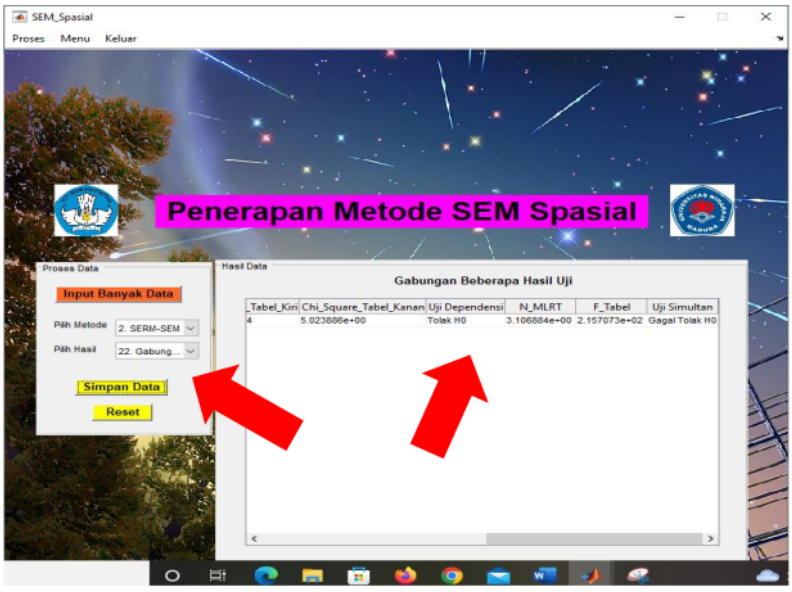
9. Kemudian pilih metode SEM Spasial (seperti SAR-SEM atau SERM-SEM)



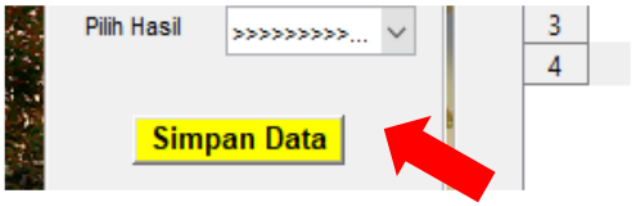
10. Pilih hasil yang diinginkan



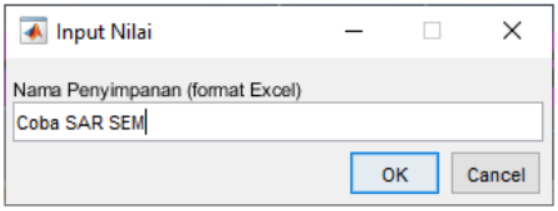
11. Misal klik no. 17 Gabungan Hasil Uji diperoleh hasil sebagai berikut



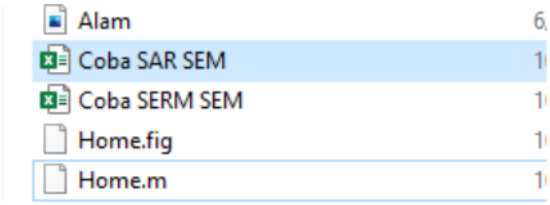
12. Kemudian hasil bisa disimpan ke dalam bentuk Excel



13. Simpan Data, beri nama penyimpanan



14. Hasil penyimpanan MS. Excel



IV. Script Bahasa Pemrogramann untuk Model SAR-SEM dan SERM-SEM Menggunakan Coding GUI Matlab

A. Coding GUI Home.m

```
function varargout = Home(varargin)
% PROSES M-file for Proses.fig
%      PROSES, by itself, creates a new PROSES or raises the existing
%      singleton*.
%
%      H = PROSES returns the handle to a new PROSES or the handle to
%      the existing singleton*.
%
%      PROSES('CALLBACK',hObject,eventData,handles,...) calls the local
%      function named CALLBACK in PROSES.M with the given input arguments.
%
%      PROSES('Property','Value',...) creates a new PROSES or raises the
%      existing singleton*.  Starting from the left, property value pairs are
%      applied to the GUI before Home_OpeningFcn gets called.  An
%      unrecognized property name or invalid value makes property application
%      stop.  All inputs are passed to Home_OpeningFcn via varargin.
%
%      *See GUI Options on GUIDE's Tools menu.  Choose "GUI allows only one
%      instance to run (singleton)".
%
% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help Proses

% Last Modified by GUIDE v2.5 07-Oct-2022 15:18:07

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                   'gui_Singleton',  gui_Singleton, ...
                   'gui_OpeningFcn', @Home_OpeningFcn, ...
                   'gui_OutputFcn',  @Home_OutputFcn, ...
                   'gui_LayoutFcn',  [] , ...
                   'gui_Callback',   []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT


% --- Executes just before Proses is made visible.
function Home_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
```

```
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to Proses (see VARARGIN)

% Choose default command line output for Proses
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);
movegui(hObject, 'center');
% UIWAIT makes Proses wait for user response (see UIRESUME)
% uiwait(handles.figure1);

handles.gambar1=imread('logo kemdikbud 2.jpg');
axes(handles.axes1);
imshow(handles.gambar1);

handles.gambar2=imread('logo unija baru1.png');
axes(handles.axes2);
imshow(handles.gambar2);

% --- Outputs from this function are returned to the command line.
function varargout = Home_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;

% --------------------------------------------------------------------
function Proses_Callback(hObject, eventdata, handles)
% hObject    handle to Proses (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)


% --------------------------------------------------------------------
function Keluar_Callback(hObject, eventdata, handles)
% hObject    handle to Keluar (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

respon=keluar('Title','Konfirmasi Keluar');

switch lower(respon)
    case 'tidak'
        %tidak ada aksi
    case 'ya'
        close
end

% --------------------------------------------------------------------
function Metode_SEM_Callback(hObject, eventdata, handles)
% hObject    handle to Metode_SEM (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
```

```
% handles    structure with handles and user data (see GUIDATA)
close
SEM_Spasial

% --------------------------------------------------------------------
function Menu_Callback(hObject, eventdata, handles)
% hObject    handle to Menu (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)


% --------------------------------------------------------------------
function Print_Callback(hObject, eventdata, handles)
% hObject    handle to Menu (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
printdlg;

% --------------------------------------------------------------------
function Home_Callback(hObject, eventdata, handles)
% hObject    handle to Home (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
```

B. Coding keluar.m

```
function varargout = keluar(varargin)
% KELUAR M-file for keluar.fig
%      KELUAR by itself, creates a new KELUAR or raises the
%      existing singleton*.
%
%      H = KELUAR returns the handle to a new KELUAR or the handle to
%      the existing singleton*.
%
%      KELUAR('CALLBACK',hObject,eventData,handles,...) calls the local
%      function named CALLBACK in KELUAR.M with the given input arguments.
%
%      KELUAR('Property','Value',...) creates a new KELUAR or raises the
%      existing singleton*.  Starting from the left, property value pairs are
%      applied to the GUI before keluar_OpeningFcn gets called.  An
%      unrecognized property name or invalid value makes property application
%      stop.  All inputs are passed to keluar_OpeningFcn via varargin.
%
%      *See GUI Options on GUIDE's Tools menu.  Choose "GUI allows only one
%      instance to run (singleton)".
%
% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help keluar

% Last Modified by GUIDE v2.5 24-Mar-2012 22:40:33

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                   'gui_Singleton',  gui_Singleton, ...
                   'gui_OpeningFcn', @keluar_OpeningFcn, ...
```

```
                   'gui_OutputFcn',  @keluar_OutputFcn, ...
                   'gui_LayoutFcn',  [] , ...
                   'gui_Callback',   []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT

% --- Executes just before keluar is made visible.
function keluar_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to keluar (see VARARGIN)

% Choose default command line output for keluar
handles.output = 'Yes';

% Update handles structure
guidata(hObject, handles);

% Insert custom Title and Text if specified by the user
% Hint: when choosing keywords, be sure they are not easily confused
% with existing figure properties.  See the output of set(figure) for
% a list of figure properties.
if(nargin > 3)
    for index = 1:2:(nargin-3),
        if nargin-3==index, break, end
        switch lower(varargin{index})
         case 'title'
          set(hObject, 'Name', varargin{index+1});
         case 'string'
          set(handles.text1, 'String', varargin{index+1});
        end
    end
end

% Determine the position of the dialog - centered on the callback figure
% if available, else, centered on the screen
FigPos=get(0,'DefaultFigurePosition');
OldUnits = get(hObject, 'Units');
set(hObject, 'Units', 'pixels');
OldPos = get(hObject,'Position');
FigWidth = OldPos(3);
FigHeight = OldPos(4);
if isempty(gcbf)
    ScreenUnits=get(0,'Units');
    set(0,'Units','pixels');
    ScreenSize=get(0,'ScreenSize');
    set(0,'Units',ScreenUnits);
```

```
    FigPos(1)=1/2*(ScreenSize(3)-FigWidth);
    FigPos(2)=2/3*(ScreenSize(4)-FigHeight);
else
    GCBFOldUnits = get(gcbf,'Units');
    set(gcbf,'Units','pixels');
    GCBFPos = get(gcbf,'Position');
    set(gcbf,'Units',GCBFOldUnits);
    FigPos(1:2) = [(GCBFPos(1) + GCBFPos(3) / 2) - FigWidth / 2, ...
                   (GCBFPos(2) + GCBFPos(4) / 2) - FigHeight / 2];
end
FigPos(3:4)=[FigWidth FigHeight];
set(hObject, 'Position', FigPos);
set(hObject, 'Units', OldUnits);

% Show a question icon from dialogicons.mat - variables questIconData
% and questIconMap
load dialogicons.mat

IconData=questIconData;
questIconMap(256,:) = get(handles.figurekeluar, 'Color');
IconCMap=questIconMap;

Img=image(IconData, 'Parent', handles.axes1);
set(handles.figurekeluar, 'Colormap', IconCMap);

set(handles.axes1, ...
    'Visible', 'off', ...
    'YDir'   , 'reverse'       , ...
    'XLim'   , get(Img,'XData'), ...
    'YLim'   , get(Img,'YData')  ...
    );

% Make the GUI modal
set(handles.figurekeluar,'WindowStyle','modal')

% UIWAIT makes keluar wait for user response (see UIRESUME)
uiwait(handles.figurekeluar);

% --- Outputs from this function are returned to the command line.
function varargout = keluar_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;

% The figure can be deleted now
delete(handles.figurekeluar);

% --- Executes on button press in ya.
function ya_Callback(hObject, eventdata, handles)
% hObject    handle to ya (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
```

```
handles.output = get(hObject,'String');

% Update handles structure
guidata(hObject, handles);

% Use UIRESUME instead of delete because the OutputFcn needs
% to get the updated handles structure.
uiresume(handles.figurekeluar);

% --- Executes on button press in tidak.
function tidak_Callback(hObject, eventdata, handles)
% hObject    handle to tidak (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

handles.output = get(hObject,'String');

% Update handles structure
guidata(hObject, handles);

% Use UIRESUME instead of delete because the OutputFcn needs
% to get the updated handles structure.
uiresume(handles.figurekeluar);


% --- Executes when user attempts to close figurekeluar.
function figurekeluar_CloseRequestFcn(hObject, eventdata, handles)
% hObject    handle to figurekeluar (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

if isequal(get(hObject, 'waitstatus'), 'waiting')
    % The GUI is still in UIWAIT, us UIRESUME
    uiresume(hObject);
else
    % The GUI is no longer waiting, just close it
    delete(hObject);
end


% --- Executes on key press over figurekeluar with no controls selected.
function figurekeluar_KeyPressFcn(hObject, eventdata, handles)
% hObject    handle to figurekeluar (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Check for "enter" or "escape"
if isequal(get(hObject,'CurrentKey'),'escape')
    % User said no by hitting escape
    handles.output = 'No';

    % Update handles structure
    guidata(hObject, handles);

    uiresume(handles.figurekeluar);
```

```
end

if isequal(get(hObject,'CurrentKey'),'return')
    uiresume(handles.figurekeluar);
end
```

C. Coding GUI SEM_Spasial.m

```
function varargout = SEM_Spasial(varargin)
% SEM_SPASIAL MATLAB code for SEM_Spasial.fig
%      SEM_SPASIAL, by itself, creates a new SEM_SPASIAL or raises the existing
%      singleton*.
%
%      H = SEM_SPASIAL returns the handle to a new SEM_SPASIAL or the handle to
%      the existing singleton*.
%
%      SEM_SPASIAL('CALLBACK',hObject,eventData,handles,...) calls the local
%      function named CALLBACK in SEM_SPASIAL.M with the given input arguments.
%
%      SEM_SPASIAL('Property','Value',...) creates a new SEM_SPASIAL or raises the
%      existing singleton*.  Starting from the left, property value pairs are
%      applied to the GUI before SEM_Spasial_OpeningFcn gets called.  An
%      unrecognized property name or invalid value makes property application
%      stop.  All inputs are passed to SEM_Spasial_OpeningFcn via varargin.
%
%      *See GUI Options on GUIDE's Tools menu.  Choose "GUI allows only one
%      instance to run (singleton)".
%
% See also: GUIDE, GUIDATA, GUIHANDLES

% Edit the above text to modify the response to help SEM_Spasial

% Last Modified by GUIDE v2.5 11-Oct-2022 14:45:38

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                   'gui_Singleton',  gui_Singleton, ...
                   'gui_OpeningFcn', @SEM_Spasial_OpeningFcn, ...
                   'gui_OutputFcn',  @SEM_Spasial_OutputFcn, ...
                   'gui_LayoutFcn',  [] , ...
                   'gui_Callback',   []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT


% --- Executes just before SEM_Spasial is made visible.
function SEM_Spasial_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
```

```
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to SEM_Spasial (see VARARGIN)

% Choose default command line output for SEM_Spasial
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);
movegui(hObject,'center');
% UIWAIT makes SEM_Spasial wait for user response (see UIRESUME)
% uiwait(handles.figure1);
background = axes('unit','normalized','position',[0 0 1 1]);
cover = imread('Alam.jpg'); imagesc(cover);
set(background,'handlevisibility','off','visible','off');
uistack(background,'bottom');

handles.gambar1=imread('logo kemdikbud 2.jpg');
axes(handles.axes1);
imshow(handles.gambar1);

handles.gambar2=imread('logo unija baru1.png');
axes(handles.axes2);
imshow(handles.gambar2);

% --- Outputs from this function are returned to the command line.
function varargout = SEM_Spasial_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;


% --- Executes on button press in Input_Banyak_Data_pushbutton.
function Input_Banyak_Data_pushbutton_Callback(hObject, eventdata, handles)
% hObject    handle to Input_Banyak_Data_pushbutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
Masukan = inputdlg({'Masukkan A','Masukkan B','Masukkan T','Masukkan p'},...
    'Input Awal',[ones(4,1) 20*ones(4,1)]);
A = str2num(Masukan{1});
B = str2num(Masukan{2});
T = str2num(Masukan{3});
p = str2num(Masukan{4});

% input data variabel laten eksogen
N_x = input_data(A,p);
O_delta = input_data(A,A);
X = input_data(A,T);

% input data variabel laten endogen
N_y = input_data(B,1);
O_epsilon = input_data(B,B);
```

```
Y = input_data(B,T);

% input data bobot spasial
W = input_data(T,T);

handles.N_x = N_x;
handles.O_delta = O_delta;
handles.X = X;
handles.N_y = N_y;
handles.O_epsilon = O_epsilon;
handles.Y = Y;
handles.W = W;
handles.A = A;
handles.B = B;
handles.T = T;
handles.p = p;
guidata(hObject,handles);

% --- Executes on selection change in Pilih_Hasil_popupmenu.
function Pilih_Hasil_popupmenu_Callback(hObject, eventdata, handles)
% hObject    handle to Pilih_Hasil_popupmenu (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: contents = cellstr(get(hObject,'String')) returns Pilih_Hasil_popupmenu
contents as cell array
%        contents{get(hObject,'Value')} returns selected item from
Pilih_Hasil_popupmenu
Pilih = get(handles.Pilih_Metode_popupmenu,'Value');
Pilih1 = get(handles.Pilih_Hasil_popupmenu,'Value');
A = handles.A;
B = handles.B;
T = handles.T;
p = handles.p;
W = handles.W;

N_x = handles.N_x;
O_delta = handles.O_delta;
X = handles.X;
N_y = handles.N_y;
O_epsilon = handles.O_epsilon;
Y = handles.Y;
alpha = 0.05; % Tingkat Signifikansi
e = ones(T,1);

% Hitung Skor Faktor Eksogen
K1 = inv(N_x'*inv(O_delta)*N_x)*N_x'*inv(O_delta)*X;
K = [ones(1,size(K1,2)); K1];

% Hitung Skor Faktor Endogen
L = inv(N_y'*inv(O_epsilon)*N_y)*N_y'*inv(O_epsilon)*Y;

%% Tentukan Parameter Model SAR-SEM
Z = [K' W*L'];
H = [K' W*K'];
P_H = H*inv(H'*H)*H';
Z_topi = P_H*Z;
```

```
delta_topi = inv(Z_topi'*Z_topi)*Z_topi'*L';
beta_topi = delta_topi(1:end-1);
eta_topi = inv(N_y'*inv(O_epsilon)*N_y)*N_y'*inv(O_epsilon)*sum(Y')';

%% Cek Uji Depedensi Spasial Model SAR-SEM
epsilon_tilde = L' - K'*beta_topi;
P = N_y'*inv(O_epsilon)*N_y;
D = (e*eta_topi - K'*beta_topi)'*W*W'*(e*eta_topi - K'*beta_topi);

if Pilih==3
    lambda_topi = delta_topi(end);
    L_topi = inv(eye(T)-lambda_topi*W)*K'*beta_topi;
    u_topi = L' - L_topi;
    g = (1/T).*[u_topi'*u_topi; u_topi'*W'*W*u_topi; u_topi'*W*u_topi];
    G = [2*(T^(-1))*u_topi'*W*u_topi -T*u_topi'*W'*W*u_topi 1;...
        2*(T^(-1))*u_topi'*W'*(W^2)*u_topi -T*u_topi'*((W^2)')*(W^2)*u_topi
trace(W'*W);...
        (T^(-1))*(u_topi'*(W^2)*u_topi+u_topi'*W'*W*u_topi) -
T*u_topi'*W'*(W^2)*u_topi 0];
    a_topi = inv(G'*G)*G'*g;
    rho = a_topi(1);

    % Statistik Uji Lagrange Multiplier
    LM_rho = (P*((epsilon_tilde'*W*epsilon_tilde)^2))/D;
    Chi_Square_Tabel_Kanan = chi2inv(1-alpha/2,1)
    Chi_Square_Tabel_Kiri = chi2inv(alpha/2,1)

    if LM_rho>Chi_Square_Tabel_Kiri && LM_lambda<Chi_Square_Tabel_Kanan
        msgbox('Hasil Uji Depedensi adalah Gagal Tolak H0','Uji Depedensi','warn');
        disp('Hasil Uji Depedensi adalah Gagal Tolak H0');
        Uji1 = {'Gagal Tolak H0'};
    else
        msgbox('Hasil Uji Depedensi adalah Tolak H0','Uji Depedensi','error');
        disp('Hasil Uji Depedensi adalah Tolak H0');
        Uji1 = {'Tolak H0'};
    end
elseif Pilih==2
    % Statistik Uji Lagrange Multiplier
    LM_lambda = -((P*(W*K'*beta_topi)'*epsilon_tilde)^2)/(P*D);
    Chi_Square_Tabel_Kanan = chi2inv(1-alpha/2,1)
    Chi_Square_Tabel_Kiri = chi2inv(alpha/2,1)

    if LM_lambda>Chi_Square_Tabel_Kiri && LM_lambda<Chi_Square_Tabel_Kanan
        msgbox('Hasil Uji Depedensi adalah Gagal Tolak H0','Uji Depedensi','warn');
        disp('Hasil Uji Depedensi adalah Gagal Tolak H0');
        Uji1 = {'Gagal Tolak H0'};
    else
        msgbox('Hasil Uji Depedensi adalah Tolak H0','Uji Depedensi','error');
        disp('Hasil Uji Depedensi adalah Tolak H0');
        Uji1 = {'Tolak H0'};
    end
end

%% Cek  Uji Simultan Menggunakan MLRT (Maximum Likelihood Ratio Test)
Hitung1 = 0; Hitung2 = 0;
for i=1:length(L)
    Hitung1 = Hitung1 + (L(i)-e*eta_topi)'*(L(i)-e*eta_topi);
    Hitung2 = Hitung2 + (L(i)-(e*eta_topi - K'*beta_topi))'*(L(i)-...
```

```
        (e*eta_topi - K'*beta_topi));
end
N_MLRT = abs(Hitung1/Hitung2);
F_Tabel = finv(1-alpha,T,T-p);

if N_MLRT>F_Tabel
    msgbox('Hasil Uji Simultan Menggunakan MLRT adalah Tolak H0',...
        'Uji Simultan','error');
    Uji2 = {'Tolak H0'};
else
    msgbox('Hasil Uji Simultan Menggunakan MLRT adalah Gagal Tolak H0',...
        'Uji Simultan','warn');
    Uji2 = {'Gagal Tolak H0'};
end

if Pilih==2
    Hasil1 = [eta_topi P D LM_lambda Chi_Square_Tabel_Kiri...
        Chi_Square_Tabel_Kanan N_MLRT F_Tabel];
    Hasil = [];
    for i=1:length(Hasil1)+2
        if i<length(Hasil1)-1
            Hasil = [Hasil {sprintf('%d',Hasil1(i))}];
        elseif i==length(Hasil1)-1
            Hasil = [Hasil Uji1];
        elseif i==length(Hasil1)+2
            Hasil = [Hasil Uji2];
        else
            Hasil = [Hasil {sprintf('%d',Hasil1(i-1))}];
        end
    end
    Kolom = {'eta_topi','P','D','LM_lambda','Chi_Square_Tabel_Kiri',...
        'Chi_Square_Tabel_Kanan','Uji Dependensi','N_MLRT','F_Tabel','Uji
Simultan'};

    if Pilih1==2
        set(handles.Hasil_text,'String','N_x');
        set(handles.Hasil_uitable,'data',N_x,'RowName','','ColumnName','');
    elseif Pilih1==3
        set(handles.Hasil_text,'String','O_delta');
        set(handles.Hasil_uitable,'data',O_delta,'RowName','','ColumnName','');
    elseif Pilih1==4
        set(handles.Hasil_text,'String','X');
        set(handles.Hasil_uitable,'data',X,'RowName','','ColumnName','');
    elseif Pilih1==5
        set(handles.Hasil_text,'String','N_y');
        set(handles.Hasil_uitable,'data',N_y,'RowName','','ColumnName','');
    elseif Pilih1==6
        set(handles.Hasil_text,'String','O_epsilon');
        set(handles.Hasil_uitable,'data',O_epsilon,'RowName','','ColumnName','');
    elseif Pilih1==7
        set(handles.Hasil_text,'String','Y');
        set(handles.Hasil_uitable,'data',Y,'RowName','','ColumnName','');
    elseif Pilih1==8
        set(handles.Hasil_text,'String','W');
        set(handles.Hasil_uitable,'data',W,'RowName','','ColumnName','');
    elseif Pilih1==9
        set(handles.Hasil_text,'String','K');
        set(handles.Hasil_uitable,'data',K,'RowName','','ColumnName','');
```

```
    elseif Pilih1==10
        set(handles.Hasil_text,'String','L');
        set(handles.Hasil_uitable,'data',L,'RowName','','ColumnName','');
    elseif Pilih1==11
        set(handles.Hasil_text,'String','Z');
        set(handles.Hasil_uitable,'data',Z,'RowName','','ColumnName','');
    elseif Pilih1==12
        set(handles.Hasil_text,'String','H');
        set(handles.Hasil_uitable,'data',H,'RowName','','ColumnName','');
    elseif Pilih1==13
        set(handles.Hasil_text,'String','P_H');
        set(handles.Hasil_uitable,'data',P_H,'RowName','','ColumnName','');
    elseif Pilih1==14
        set(handles.Hasil_text,'String','Z_topi');
        set(handles.Hasil_uitable,'data',Z_topi,'RowName','','ColumnName','');
    elseif Pilih1==15
        set(handles.Hasil_text,'String','beta_topi');
        set(handles.Hasil_uitable,'data',beta_topi,'RowName','','ColumnName','');
    elseif Pilih1==16
        set(handles.Hasil_text,'String','delta_topi');
        set(handles.Hasil_uitable,'data',delta_topi,'RowName','','ColumnName','');
    elseif Pilih1==17
        set(handles.Hasil_text,'String','epsilon_tilde');

set(handles.Hasil_uitable,'data',epsilon_tilde,'RowName','','ColumnName','');
    else
        set(handles.Hasil_text,'String','Gabungan Beberapa Hasil Uji');
        set(handles.Hasil_uitable,'data',Hasil,'RowName','','ColumnName',Kolom);
    end
else
    Hasil1 = [eta_topi lambda_topi rho P D LM_rho Chi_Square_Tabel_Kiri...
        Chi_Square_Tabel_Kanan N_MLRT F_Tabel];
    Hasil = [];
    for i=1:length(Hasil1)+2
        if i<length(Hasil1)-1
            Hasil = [Hasil {sprintf('%d',Hasil1(i))}];
        elseif i==length(Hasil1)-1
            Hasil = [Hasil Uji1];
        elseif i==length(Hasil1)+2
            Hasil = [Hasil Uji2];
        else
            Hasil = [Hasil {sprintf('%d',Hasil1(i-1))}];
        end
    end
    Kolom =
{'eta_topi','lambda_topi','rho','P','D','LM_rho','Chi_Square_Tabel_Kiri',...
        'Chi_Square_Tabel_Kanan','Uji Dependensi','N_MLRT','F_Tabel','Uji
Simultan'};

    if Pilih1==2
        set(handles.Hasil_text,'String','N_x');
        set(handles.Hasil_uitable,'data',N_x,'RowName','','ColumnName','');
    elseif Pilih1==3
        set(handles.Hasil_text,'String','O_delta');
        set(handles.Hasil_uitable,'data',O_delta,'RowName','','ColumnName','');
    elseif Pilih1==4
        set(handles.Hasil_text,'String','X');
        set(handles.Hasil_uitable,'data',X,'RowName','','ColumnName','');
    elseif Pilih1==5
```

```
            set(handles.Hasil_text,'String','N_y');
            set(handles.Hasil_uitable,'data',N_y,'RowName','','ColumnName','');
        elseif Pilih1==6
            set(handles.Hasil_text,'String','O_epsilon');
            set(handles.Hasil_uitable,'data',O_epsilon,'RowName','','ColumnName','');
        elseif Pilih1==7
            set(handles.Hasil_text,'String','Y');
            set(handles.Hasil_uitable,'data',Y,'RowName','','ColumnName','');
        elseif Pilih1==8
            set(handles.Hasil_text,'String','W');
            set(handles.Hasil_uitable,'data',W,'RowName','','ColumnName','');
        elseif Pilih1==9
            set(handles.Hasil_text,'String','K');
            set(handles.Hasil_uitable,'data',K,'RowName','','ColumnName','');
        elseif Pilih1==10
            set(handles.Hasil_text,'String','L');
            set(handles.Hasil_uitable,'data',L,'RowName','','ColumnName','');
        elseif Pilih1==11
            set(handles.Hasil_text,'String','Z');
            set(handles.Hasil_uitable,'data',Z,'RowName','','ColumnName','');
        elseif Pilih1==12
            set(handles.Hasil_text,'String','H');
            set(handles.Hasil_uitable,'data',H,'RowName','','ColumnName','');
        elseif Pilih1==13
            set(handles.Hasil_text,'String','P_H');
            set(handles.Hasil_uitable,'data',P_H,'RowName','','ColumnName','');
        elseif Pilih1==14
            set(handles.Hasil_text,'String','Z_topi');
            set(handles.Hasil_uitable,'data',Z_topi,'RowName','','ColumnName','');
        elseif Pilih1==15
            set(handles.Hasil_text,'String','beta_topi');
            set(handles.Hasil_uitable,'data',beta_topi,'RowName','','ColumnName','');
        elseif Pilih1==16
            set(handles.Hasil_text,'String','delta_topi');
            set(handles.Hasil_uitable,'data',delta_topi,'RowName','','ColumnName','');
        elseif Pilih1==17
            set(handles.Hasil_text,'String','L_topi');
            set(handles.Hasil_uitable,'data',L_topi,'RowName','','ColumnName','');
        elseif Pilih1==18
            set(handles.Hasil_text,'String','u_topi');
            set(handles.Hasil_uitable,'data',u_topi,'RowName','','ColumnName','');
        elseif Pilih1==19
            set(handles.Hasil_text,'String','g');
            set(handles.Hasil_uitable,'data',g,'RowName','','ColumnName','');
        elseif Pilih1==20
            set(handles.Hasil_text,'String','G');
            set(handles.Hasil_uitable,'data',G,'RowName','','ColumnName','');
        elseif Pilih1==21
            set(handles.Hasil_text,'String','a_topi');
            set(handles.Hasil_uitable,'data',a_topi,'RowName','','ColumnName','');
        elseif Pilih1==22
            set(handles.Hasil_text,'String','epsilon_tilde');

    set(handles.Hasil_uitable,'data',epsilon_tilde,'RowName','','ColumnName','');
        else
            set(handles.Hasil_text,'String','Gabungan Beberapa Hasil Uji');
            set(handles.Hasil_uitable,'data',Hasil,'RowName','','ColumnName',Kolom);
        end
    end
```

```
handles.N_x = N_x;
handles.O_delta = O_delta;
handles.X = X;
handles.N_y = N_y;
handles.O_epsilon = O_epsilon;
handles.Y = Y;
handles.W = W;
handles.K = K;
handles.L = L;
handles.Z = Z;
handles.H = H;
handles.P_H = P_H;
handles.Z_topi = Z_topi;
handles.beta_topi = beta_topi;
handles.delta_topi = delta_topi;
handles.epsilon_tilde = epsilon_tilde;
handles.Kolom = Kolom;
handles.Hasil = Hasil;

if Pilih==3
    handles.L_topi = L_topi;
    handles.u_topi = u_topi;
    handles.g = g;
    handles.G = G;
    handles.a_topi = a_topi;
end
guidata(hObject,handles);

% --- Executes during object creation, after setting all properties.
function Pilih_Hasil_popupmenu_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Pilih_Hasil_popupmenu (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: popupmenu controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end


% --- Executes on button press in Simpan_Data_pushbutton.
function Simpan_Data_pushbutton_Callback(hObject, eventdata, handles)
% hObject    handle to Simpan_Data_pushbutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
Pilih = get(handles.Pilih_Metode_popupmenu,'Value');
N_x = handles.N_x;
O_delta = handles.O_delta;
X = handles.X;
N_y = handles.N_y;
O_epsilon = handles.O_epsilon;
Y = handles.Y;
W = handles.W;
K = handles.K;
L = handles.L;
```

```
Z = handles.Z;
H = handles.H;
P_H = handles.P_H;
Z_topi = handles.Z_topi;
beta_topi = handles.beta_topi;
delta_topi = handles.delta_topi;
epsilon_tilde = handles.epsilon_tilde;
Kolom = handles.Kolom;
Hasil = handles.Hasil;

if Pilih==3
    L_topi = handles.L_topi;
    u_topi = handles.u_topi;
    g = handles.g;
    G = handles.G;
    a_topi = handles.a_topi;
end

Pertanyaan = inputdlg({'Nama Penyimpanan (format Excel)'},'Input Nilai', [1 50]);
Jawaban = Pertanyaan{:};
delete([Jawaban,'.xlsx']);

xlswrite([Jawaban,'.xlsx'],N_x,'N_x','A1');
xlswrite([Jawaban,'.xlsx'],O_delta,'O_delta','A1');
xlswrite([Jawaban,'.xlsx'],X,'X','A1');
xlswrite([Jawaban,'.xlsx'],N_y,'N_y','A1');
xlswrite([Jawaban,'.xlsx'],O_epsilon,'O_epsilon','A1');
xlswrite([Jawaban,'.xlsx'],Y,'Y','A1');
xlswrite([Jawaban,'.xlsx'],W,'W','A1');
xlswrite([Jawaban,'.xlsx'],K,'K','A1');
xlswrite([Jawaban,'.xlsx'],L,'L','A1');
xlswrite([Jawaban,'.xlsx'],Z,'Z','A1');
xlswrite([Jawaban,'.xlsx'],H,'H','A1');
xlswrite([Jawaban,'.xlsx'],P_H,'P_H','A1');
xlswrite([Jawaban,'.xlsx'],Z_topi,'Z_topi','A1');
xlswrite([Jawaban,'.xlsx'],delta_topi,'delta_topi','A1');
xlswrite([Jawaban,'.xlsx'],beta_topi,'beta_topi','A1');
xlswrite([Jawaban,'.xlsx'],epsilon_tilde,'epsilon_tilde','A1');
xlswrite([Jawaban,'.xlsx'],Kolom,'Hasil Uji','A1');
xlswrite([Jawaban,'.xlsx'],Hasil,'Hasil Uji','A2');

if Pilih==3
    xlswrite([Jawaban,'.xlsx'],L_topi,'L_topi','A1');
    xlswrite([Jawaban,'.xlsx'],u_topi,'u_topi','A1');
    xlswrite([Jawaban,'.xlsx'],g,'g','A1');
    xlswrite([Jawaban,'.xlsx'],G,'G','A1');
    xlswrite([Jawaban,'.xlsx'],a_topi,'a_topi','A1');
end

% --- Executes on selection change in Pilih_Metode_popupmenu.
function Pilih_Metode_popupmenu_Callback(hObject, eventdata, handles)
% hObject    handle to Pilih_Metode_popupmenu (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Hints: contents = cellstr(get(hObject,'String')) returns Pilih_Metode_popupmenu
contents as cell array
```

```
%        contents{get(hObject,'Value')} returns selected item from
Pilih_Metode_popupmenu
Pilih = get(handles.Pilih_Metode_popupmenu,'Value');

if Pilih==2
    set(handles.Pilih_Hasil_popupmenu,'String',{'>>>>>>>>>>Selected
Data<<<<<<<<<<';...
        '1. N_x';'2. O_delta';'3. X';'4. N_y';'5. O_epsilon';'6. Y';'7. W';...
        '8. K';'9. L';'10. Z';'11. H';'12. P_H';'13. Z_topi';'14. beta_topi';...
        '15. delta_topi';'16. epsilon_tilde';'17. Gabungan Hasil Uji'});
else
    set(handles.Pilih_Hasil_popupmenu,'String',{'>>>>>>>>>>Selected
Data<<<<<<<<<<';...
        '1. N_x';'2. O_delta';'3. X';'4. N_y';'5. O_epsilon';'6. Y';'7. W';...
        '8. K';'9. L';'10. Z';'11. H';'12. P_H';'13. Z_topi';'14. beta_topi';...
        '15. delta_topi';'16. L_topi';'17. u_topi';'18. g';'19. G';'20. a_topi';...
        '21. epsilon_tilde';'22. Gabungan Hasil Uji'});
end

% --- Executes during object creation, after setting all properties.
function Pilih_Metode_popupmenu_CreateFcn(hObject, eventdata, handles)
% hObject    handle to Pilih_Metode_popupmenu (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    empty - handles not created until after all CreateFcns called

% Hint: popupmenu controls usually have a white background on Windows.
%       See ISPC and COMPUTER.
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end


% --- Executes on button press in Reset_pushbutton.
function Reset_pushbutton_Callback(hObject, eventdata, handles)
% hObject    handle to Reset_pushbutton (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
set(handles.Hasil_text,'String','');
set(handles.Hasil_uitable,'data','','RowName','','ColumnName','');

% --------------------------------------------------------------------
function Proses_Callback(hObject, eventdata, handles)
% hObject    handle to Proses (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)


% --------------------------------------------------------------------
function Menu_Callback(hObject, eventdata, handles)
% hObject    handle to Menu (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)


% --------------------------------------------------------------------
function Keluar_Callback(hObject, eventdata, handles)
```

```
% hObject    handle to Keluar (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
respon=keluar('Title','Konfirmasi Keluar');

switch lower(respon)
    case 'tidak'
        %tidak ada aksi
    case 'ya'
        close
end

% --------------------------------------------------------------------
function Home_Callback(hObject, eventdata, handles)
% hObject    handle to Home (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
close
Home

% --------------------------------------------------------------------
function Metode_SEM_Callback(hObject, eventdata, handles)
% hObject    handle to Metode_SEM (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)


% --------------------------------------------------------------------
function Print_Callback(hObject, eventdata, handles)
% hObject    handle to Print (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
printdlg;
```

D. Coding M-File input_data.m

```
function Hasil=input_data(m,n)

Jawaban = [];
for j=1:n
    Jawaban2 = []; m1 = 0;
    for i=1:ceil(m/10)
        Sisa = m - m1;
        if Sisa>=10
            Sisa1 = 10;
        else
            Sisa1 = Sisa;
        end

        Soal = [];
        for k=1:Sisa1
            m1 = m1+1;
            Soal = [Soal; {sprintf('Nilai(%d,%d) = ',m1,j)}];
        end
        Pertanyaan = inputdlg(Soal,'Input Nilai', [ones(Sisa1,1)
20.*ones(Sisa1,1)]);
```

```
            Jawaban1 = [];
            for k=1:Sisa1
                Jawaban1 = [Jawaban1; str2num(Pertanyaan{k})];
            end
            Jawaban2 = [Jawaban2; Jawaban1];
        end
        Jawaban = [Jawaban Jawaban2];
    end
    Hasil = Jawaban;
```

V. Script Bahasa Pemrogramann untuk Model SAR-SEM dan SERM-SEM Menggunakan Coding M-File Matlab

A. Coding M-File SAR_SEM.m

```
clc; clear; close all;

Masukan = inputdlg({'Masukkan A','Masukkan B','Masukkan T','Masukkan p'},...
    'Input Awal',[ones(4,1) 20*ones(4,1)]);
A = str2num(Masukan{1});
B = str2num(Masukan{2});
T = str2num(Masukan{3});
p = str2num(Masukan{4});
alpha = 0.05; % Tingkat Signifikansi

e = ones(T,1);
% input data variabel laten eksogen
N_x = input_data(A,p);
O_delta = input_data(A,A);
X = input_data(A,T);

% input data variabel laten endogen
N_y = input_data(B,1);
O_epsilon = input_data(B,B);
Y = input_data(B,T);

% input data bobot spasial
W = input_data(T,T);

% Hitung Skor Faktor Eksogen
K1 = inv(N_x'*inv(O_delta)*N_x)*N_x'*inv(O_delta)*X;
K = [ones(1,size(K1,2)); K1]

% Hitung Skor Faktor Endogen
L = inv(N_y'*inv(O_epsilon)*N_y)*N_y'*inv(O_epsilon)*Y

%% Tentukan Parameter Model SAR-SEM
Z = [K' W*L']
H = [K' W*K']
P_H = H*inv(H'*H)*H'
Z_topi = P_H*Z
delta_topi = inv(Z_topi'*Z_topi)*Z_topi'*L'
beta_topi = delta_topi(1:end-1)
eta_topi = inv(N_y'*inv(O_epsilon)*N_y)*N_y'*inv(O_epsilon)*sum(Y')'

%% Cek Uji Depedensi Spasial Model SAR-SEM
epsilon_tilde = L' - K'*beta_topi
P = N_y'*inv(O_epsilon)*N_y
D = (e*eta_topi - K'*beta_topi)'*W*W'*(e*eta_topi - K'*beta_topi)

% Statistik Uji Lagrange Multiplier
LM_lambda = ((P*(W*K'*beta_topi)*epsilon_tilde)^2)/(P*D)
Chi_Square_Tabel_Kanan = chi2inv(1-alpha/2,1)
Chi_Square_Tabel_Kiri = chi2inv(alpha/2,1)
```

```
if LM_lambda>Chi_Square_Tabel_Kiri && LM_lambda<Chi_Square_Tabel_Kanan
    msgbox('Hasil Uji Depedensi adalah Gagal Tolak H0','Uji Depedensi','warn');
    disp('Hasil Uji Depedensi adalah Gagal Tolak H0');
    Uji1 = {'Gagal Tolak H0'};
else
    msgbox('Hasil Uji Depedensi adalah Tolak H0','Uji Depedensi','error');
    disp('Hasil Uji Depedensi adalah Tolak H0');
    Uji1 = {'Tolak H0'};
end

%% Cek  Uji Simultan Menggunakan MLRT (Maximum Likelihood Ratio Test)
Hitung1 = 0; Hitung2 = 0;
for i=1:length(L)
    Hitung1 = Hitung1 + (L(i)-e*eta_topi)'*(L(i)-e*eta_topi);
    Hitung2 = Hitung2 + (L(i)-(e*eta_topi - K'*beta_topi))'*(L(i)-...
        (e*eta_topi - K'*beta_topi));
end
N_MLRT = abs(Hitung1/Hitung2)
F_Tabel = finv(1-alpha,T,T-p)

if N_MLRT>F_Tabel
    disp('Hasil Uji Simultan Menggunakan MLRT adalah Tolak H0');
    Uji2 = {'Tolak H0'};
else
    disp('Hasil Uji Simultan Menggunakan MLRT adalah Gagal Tolak H0');
    Uji2 = {'Gagal Tolak H0'};
end

Tanya = inputdlg({'Apakah data hasil ingin disimpan (Y/N) ?'},'File Tanya !!!',...
    [1 20]);
Simpan = Tanya{:};
if lower(Simpan)=='y'
    Pertanyaan = inputdlg({'Nama Penyimpanan (format Excel)'},'Input Nilai', [1
50]);
    Jawaban = Pertanyaan{:};
    delete([Jawaban,'.xlsx']);
    Hasil1 = [eta_topi P D LM_lambda Chi_Square_Tabel_Kiri...
        Chi_Square_Tabel_Kanan N_MLRT F_Tabel];

    Hasil = [];
    for i=1:length(Hasil1)+2
        if i<length(Hasil1)-1
            Hasil = [Hasil {sprintf('%d',Hasil1(i))}];
        elseif i==length(Hasil1)-1
            Hasil = [Hasil Uji1];
        elseif i==length(Hasil1)+2
            Hasil = [Hasil Uji2];
        else
            Hasil = [Hasil {sprintf('%d',Hasil1(i-1))}];
        end
    end
    Kolom = {'eta_topi','P','D','LM_lambda','Chi_Square_Tabel_Kiri',...
        'Chi_Square_Tabel_Kanan','Uji Dependensi','N_MLRT','F_Tabel','Uji
Simultan'};

    xlswrite([Jawaban,'.xlsx'],N_x,'N_x','A1');
    xlswrite([Jawaban,'.xlsx'],O_delta,'O_delta','A1');
    xlswrite([Jawaban,'.xlsx'],X,'X','A1');
```

```
    xlswrite([Jawaban,'.xlsx'],N_y,'N_y','A1');
    xlswrite([Jawaban,'.xlsx'],O_epsilon,'O_epsilon','A1');
    xlswrite([Jawaban,'.xlsx'],Y,'Y','A1');
    xlswrite([Jawaban,'.xlsx'],W,'W','A1');
    xlswrite([Jawaban,'.xlsx'],K,'K','A1');
    xlswrite([Jawaban,'.xlsx'],L,'L','A1');
    xlswrite([Jawaban,'.xlsx'],Z,'Z','A1');
    xlswrite([Jawaban,'.xlsx'],H,'H','A1');
    xlswrite([Jawaban,'.xlsx'],P_H,'P_H','A1');
    xlswrite([Jawaban,'.xlsx'],Z_topi,'Z_topi','A1');
    xlswrite([Jawaban,'.xlsx'],delta_topi,'delta_topi','A1');
    xlswrite([Jawaban,'.xlsx'],beta_topi,'beta_topi','A1');
    xlswrite([Jawaban,'.xlsx'],epsilon_tilde,'epsilon_tilde','A1');
    xlswrite([Jawaban,'.xlsx'],Kolom,'Hasil Uji','A1');
    xlswrite([Jawaban,'.xlsx'],Hasil,'Hasil Uji','A2');
end
disp('>>>>>>>>>>>>>>>>>>>> Terima Kasih <<<<<<<<<<<<<<<<<<<<');
```

B. Coding M-File SERM_SEM.m

```
clc; clear; close all;

Masukan = inputdlg({'Masukkan A','Masukkan B','Masukkan T','Masukkan p'},...
    'Input Awal',[ones(4,1) 20*ones(4,1)]);
A = str2num(Masukan{1});
B = str2num(Masukan{2});
T = str2num(Masukan{3});
p = str2num(Masukan{4});
alpha = 0.05; % Tingkat Signifikansi

e = ones(T,1);
% input data variabel laten eksogen
N_x = input_data(A,p);
O_delta = input_data(A,A);
X = input_data(A,T);

% input data variabel laten endogen
N_y = input_data(B,1);
O_epsilon = input_data(B,B);
Y = input_data(B,T);

% input data bobot spasial
W = input_data(T,T);

% Hitung Skor Faktor Eksogen
K1 = inv(N_x'*inv(O_delta)*N_x)*N_x'*inv(O_delta)*X;
K = [ones(1,size(K1,2)); K1]

% Hitung Skor Faktor Endogen
L = inv(N_y'*inv(O_epsilon)*N_y)*N_y'*inv(O_epsilon)*Y

%% Tentukan Parameter Model SERM-SEM
Z = [K' W*L']
H = [K' W*K']
P_H = H*inv(H'*H)*H'
Z_topi = P_H*Z
```

```
delta_topi = inv(Z_topi'*Z_topi)*Z_topi'*L'
beta_topi = delta_topi(1:end-1)
eta_topi = inv(N_y'*inv(O_epsilon)*N_y)*N_y'*inv(O_epsilon)*sum(Y')'
lambda_topi = delta_topi(end)
L_topi = inv(eye(T)-lambda_topi*W)*K'*beta_topi
u_topi = L' - L_topi
g = (1/T).*[u_topi'*u_topi; u_topi'*W'*W*u_topi; u_topi'*W*u_topi]
G = [2*(T^(-1))*u_topi'*W*u_topi -T*u_topi'*W'*W*u_topi 1;...
    2*(T^(-1))*u_topi'*W'*(W^2)*u_topi -T*u_topi'*((W^2)')*(W^2)*u_topi
trace(W'*W);...
    (T^(-1))*(u_topi'*(W^2)*u_topi+u_topi'*W'*W*u_topi) -T*u_topi'*W'*(W^2)*u_topi
0]
a_topi = inv(G'*G)*G'*g
rho = a_topi(1)

%% Cek Uji Depedensi Spasial Model SERM-SEM
epsilon_tilde = L' - K'*beta_topi
P = N_y'*inv(O_epsilon)*N_y
D = (e*eta_topi - K'*beta_topi)'*W*W'*(e*eta_topi - K'*beta_topi)

% Statistik Uji Lagrange Multiplier
LM_rho = (P*((epsilon_tilde'*W*epsilon_tilde)^2))/D
Chi_Square_Tabel_Kanan = chi2inv(1-alpha/2,1)
Chi_Square_Tabel_Kiri = chi2inv(alpha/2,1)

if LM_rho>Chi_Square_Tabel_Kiri && LM_lambda<Chi_Square_Tabel_Kanan
    msgbox('Hasil Uji Depedensi adalah Gagal Tolak H0','Uji Depedensi','warn');
    disp('Hasil Uji Depedensi adalah Gagal Tolak H0');
    Uji1 = {'Gagal Tolak H0'};
else
    msgbox('Hasil Uji Depedensi adalah Tolak H0','Uji Depedensi','error');
    disp('Hasil Uji Depedensi adalah Tolak H0');
    Uji1 = {'Tolak H0'};
end

%% Cek  Uji Simultan Menggunakan MLRT (Maximum Likelihood Ratio Test)
Hitung1 = 0; Hitung2 = 0;
for i=1:length(L)
    Hitung1 = Hitung1 + (L(i)-e*eta_topi)'*(L(i)-e*eta_topi);
    Hitung2 = Hitung2 + (L(i)-(e*eta_topi - K'*beta_topi))'*(L(i)-...
        (e*eta_topi - K'*beta_topi));
end
N_MLRT = abs(Hitung1/Hitung2)
F_Tabel = finv(1-alpha,T,T-p)

if N_MLRT>F_Tabel
    disp('Hasil Uji Simultan Menggunakan MLRT adalah Tolak H0');
else
    disp('Hasil Uji Simultan Menggunakan MLRT adalah Gagal Tolak H0');
end

Tanya = inputdlg({'Apakah data hasil ingin disimpan (Y/N) ?'},'File Tanya !!!',...
    [1 20]);
Simpan = Tanya{:};
if lower(Simpan)=='y'
    Pertanyaan = inputdlg({'Nama Penyimpanan (format Excel)'},'Input Nilai', [1
50]);
    Jawaban = Pertanyaan{:};
```

```
    delete([Jawaban,'.xlsx']);
    Hasil1 = [eta_topi lambda_topi rho P D LM_rho Chi_Square_Tabel_Kiri...
        Chi_Square_Tabel_Kanan N_MLRT F_Tabel];

    Hasil = [];
    for i=1:length(Hasil1)+2
        if i<length(Hasil1)-1
            Hasil = [Hasil {sprintf('%d',Hasil1(i))}];
        elseif i==length(Hasil1)-1
            Hasil = [Hasil Uji1];
        elseif i==length(Hasil1)+2
            Hasil = [Hasil Uji2];
        else
            Hasil = [Hasil {sprintf('%d',Hasil1(i-1))}];
        end
    end
    Kolom = {'eta_topi','lambda_topi','rho','P','D','LM_rho','Chi_Square_Tabel',...
        'Uji Dependensi','N_MLRT','F_Tabel','Uji Simultan'};

    xlswrite([Jawaban,'.xlsx'],N_x,'N_x','A1');
    xlswrite([Jawaban,'.xlsx'],O_delta,'O_delta','A1');
    xlswrite([Jawaban,'.xlsx'],X,'X','A1');
    xlswrite([Jawaban,'.xlsx'],N_y,'N_y','A1');
    xlswrite([Jawaban,'.xlsx'],O_epsilon,'O_epsilon','A1');
    xlswrite([Jawaban,'.xlsx'],Y,'Y','A1');
    xlswrite([Jawaban,'.xlsx'],W,'W','A1');
    xlswrite([Jawaban,'.xlsx'],K,'K','A1');
    xlswrite([Jawaban,'.xlsx'],L,'L','A1');
    xlswrite([Jawaban,'.xlsx'],Z,'Z','A1');
    xlswrite([Jawaban,'.xlsx'],H,'H','A1');
    xlswrite([Jawaban,'.xlsx'],P_H,'P_H','A1');
    xlswrite([Jawaban,'.xlsx'],Z_topi,'Z_topi','A1');
    xlswrite([Jawaban,'.xlsx'],delta_topi,'delta_topi','A1');
    xlswrite([Jawaban,'.xlsx'],beta_topi,'beta_topi','A1');
    xlswrite([Jawaban,'.xlsx'],L_topi,'L_topi','A1');
    xlswrite([Jawaban,'.xlsx'],u_topi,'u_topi','A1');
    xlswrite([Jawaban,'.xlsx'],g,'g','A1');
    xlswrite([Jawaban,'.xlsx'],G,'G','A1');
    xlswrite([Jawaban,'.xlsx'],a_topi,'a_topi','A1');
    xlswrite([Jawaban,'.xlsx'],epsilon_tilde,'epsilon_tilde','A1');
    xlswrite([Jawaban,'.xlsx'],Kolom,'Hasil Uji','A1');
    xlswrite([Jawaban,'.xlsx'],Hasil,'Hasil Uji','A2');
end
disp('>>>>>>>>>>>>>>>>>>>> Terima Kasih <<<<<<<<<<<<<<<<<<<<');
```

C. Coding M-File input_data.m

```
function Hasil=input_data(m,n)

Jawaban = [];
for j=1:n
    Jawaban2 = []; m1 = 0;
    for i=1:ceil(m/10)
        Sisa = m - m1;
        if Sisa>=10
            Sisa1 = 10;
        else
```

```
            Sisa1 = Sisa;
        end

        Soal = [];
        for k=1:Sisa1
            m1 = m1+1;
            Soal = [Soal; {sprintf('Nilai(%d,%d) = ',m1,j)}];
        end
        Pertanyaan = inputdlg(Soal,'Input Nilai', [ones(Sisa1,1)
20.*ones(Sisa1,1)]);

        Jawaban1 = [];
        for k=1:Sisa1
            Jawaban1 = [Jawaban1; str2num(Pertanyaan{k})];
        end
        Jawaban2 = [Jawaban2; Jawaban1];
    end
    Jawaban = [Jawaban Jawaban2];
end
Hasil = Jawaban;
```

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