Russia's Shifting Demographics

New Mexico
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Team 90
Santa Fe High School

Team Members:

Kelsey Thomas

Teacher:

Anita Gerlach

Project Mentor:

Vincent Thomas

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Executive Summary

The Russian population is currently undergoing a negative growth rate and thus a population decline. Non-ethnic Russians, most notably the Tartars, have been experiencing high growth rates and have the potential to overtake the ethnic Russians within the century. This poses many possible problems, especially tensions among ethnic groups.

My project aimed to create a reasonable projection of the Russian population, broken down into ethnic Russians and non-ethnic Russians, over the next hundred years. The program computes an array of possible population outcomes when options (birth rate and decade growth rate, among others) are entered. There are certain random factors included in the program to rake into account variations in human population patterns.

Introduction

Population is a critical issue, not just in Russia but worldwide. While some countries, such as India, are experiencing large growth rates, Russia's population has been decreasing for several years. The current male life expectancy is estimated to be 58 or 59 years; the female life expectancy, 72 years, is less devastating, but is not on par with that of other industrialized nations. Poor healthcare services, frequent rates of drug usage, and a high prevalence of poverty are, in part, to blame. An interesting aspect to the situation is that the non-ethnic Russians (20% of the population in the 2002 census) are not having the same population difficulties; many groups are growing rapidly.

My project provides an array of estimates for the population of Russia, broken down into ethnic Russian and non-ethnic Russian sections, over the next century. It aims to compute a reasonable range for the population and its composition, including a ratio of ethnic Russians to non-ethnic Russians.

Description

I first researched Russian population statistics to provide me with current birth rates and other vital statistics. I was able to find information from both the 1989 Census and the 2002 Census; I would have liked to have more data points, but due to Russia's history, most statistics either do not exist or are not available. Many of the statistics that I was able to find were in Russian, and my mentor helped me translate parts of them. I created a basic population growth model and continued researching statistics. I then decided to use Visual Basics for Applications (VBA) in Microsoft Excel and began to learn from recording macros. The project gradually increased in complexity, with the
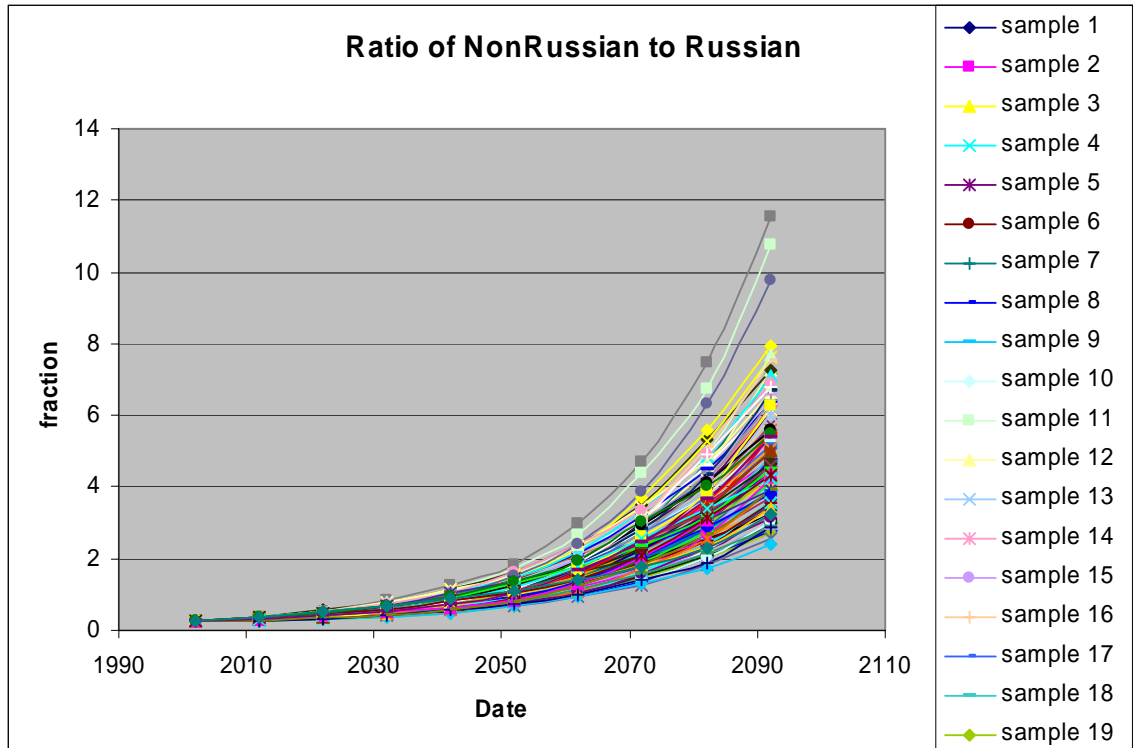
addition of random factors to help account for the random events in human lives that no computer can predict. I added graphs to aid in visualizing the results.

The most notable limit to my project was the lack of information available. I was unable to find much information earlier than 1989. The variety of ethnic groups (there were about 160 different ethnic groups reported in the 2002 Census) provided me with another obstacle. I decided to try and estimate the growth rates for all the groups and head them all under a "non-ethnic Russians" label. The birth rate for the non-ethnic Russians is only an estimate from the information I was able to find.

Results

The population of the non-ethnic Russians overtook that of the ethnic Russians, in some trials, as early as 2035 or 2040. The ethnic Russians, using their current estimated birth rate of 1.1 births per woman, experienced a steady decline. If I raised the birth rate to 1.5, the population dropped again, but this time less steeply. Putting in a birth rate of 3.5 enabled the population to increase, but first it had to cycle through the generations born during the 1.1 birth rate time period. The non-ethnic Russians experienced a general increase in their population while the entire population of Russia decreased slightly and then proceeded to increase.

The program provides reasonable estimates for the population given the information available. On the following page is a graph of the ratio of non-Russian to Russian generated from a trial. It illustrates the array of possibilities in an effort to provide a more accurate prediction of population growth or decline.

Ratio of NonRussian to Russian

Legend: sample 1, sample 2, sample 3, sample 4, sample 5, sample 6, sample 7, sample 8, sample 9, sample 10, sample 11, sample 12, sample 13, sample 14, sample 15, sample 16, sample 17, sample 18, sample 19

fraction (y-axis), Date (x-axis)

Conclusions

The program provides estimates for the future of the Russian population, broken down into ethnic Russians and non-ethnic Russians. It utilized the available information and statistics on the subject; however, it would have been better to have more data sources and past population statistics. There is also the questionable reliability of the Census results, but this is all the information available to the public. The program has the potential to be used for any population group if current statistics are furnished.

The Russian population really is in a troublesome position. Racial tensions and separatist groups make for unpleasant consequences of historical conflicts, and a shrinking population will do nothing to alleviate the problem. The fact that some of the non-Russian ethnic groups have the potential to overtake the ethnic Russians within the

next forty years is another source of possible conflict. As healthcare continues to

deteriorate and the AIDS problem, exacerbated by intravenous drug usage, continues to

worsen, the outlook is very dire. A crisis waiting to happen, if you will.

Recommendations

A major issue that my project did not address is emigration/immigration to and

from Russia. I didn't have the statistics, nor did I have any more time. Then there is the

question of the ethnicities of the immigrants and emigrants, as well as their age ranges.

The addition of the immigration factor would be essential in making the project more

realistic. Another crucial issue is that it is not accurate to lump all the other ethnic groups

together; not all are increasing at such high rates. It would be more accurate to have, say,

ten major population groups if more time and statistics were available. The graphs could

also be cleaned up, the legends gotten rid of.

Acknowledgements

A huge thank you to my mentor and dad, Vincent Thomas. Also a thank you to Dr.

Murray Feshbach, Senior Scholar at the Woodrow Wilson International Center for

Scholars, for his help in locating statistics.

References

*I have two sources from Dr. Murray Feshbach that are in Russian. I was unsure of how to put them in my references.

Title:	**Национальный состав населения Российской Федерации (тыс. человек)**
Publisher:	Gosudarstvennyi komitet Rossiiskoi Federatsii po statistike
Publication:	Voprosy statistiki
Issue:	012, Wed, Dec 31, '03
Chapter:	ОСНОВНЫЕ ИТОГИ ВСЕРОССИЙСКОЙ ПЕРЕПИСИ НАСЕЛЕНИЯ 2002 ГОДА

Title:	**ЧИСЛЕННОСТЬ НАСЕЛЕНИЯ НАИБОЛЕЕ МНОГОЧИСЛЕННЫХ НАЦИОНАЛЬНОСТЕЙ**[2)]
Publisher:	Gosudarstvennyi komitet Rossiiskoi Federatsii po statistike
Publication:	Statisticheskii' biulleten'
Issue:	003, Sat, May 15, '04
Chapter:	ОБ ИТОГАХ ВСЕРОССИЙСКОЙ ПЕРЕПИСИ НАСЕЛЕНИЯ 2002 ГОДА

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Appendix A: Code

```
Const Nx = 9
' array size for age splits
 Dim Population(1 To Nx) As Double
 Dim Male(1 To Nx) As Double
 Dim Female(1 To Nx) As Double
 Dim FertilityFactor(1 To Nx) As Double
 Dim FertilityRate(1 To Nx) As Double
 Dim ContinuationFactor(1 To Nx) As Double
 Dim Births(1 To Nx) As Double
 Dim MaleSexRatio(1 To Nx) As Double
 Dim FemaleSexRatio(1 To Nx) As Double

 Dim SumPopulation As Double

 Const RwZero = 5
 Const ColZero = 7
 Const MaleIndex = ColZero
 Const MaleSexRatioIndex = ColZero + 1
 Const FemaleIndex = ColZero + 2
 Const FemaleSexRatioIndex = ColZero + 3
 Const TotalIndex = ColZero + 4
 Const ContinuationFactorIndex = ColZero + 5
 Const FertilityFactorIndex = ColZero + 6
 Const FertilityRateIndex = ColZero + 7
 Const BirthsIndex = ColZero + 8

   Const ntime = 10 ' 100 years !
   Public TotalPopulation(1 To ntime) As Double
   Public NonRussian(1 To ntime) As Double
   Public Russian(1 To ntime) As Double
   Public TotalTime(1 To ntime) As Double
   Public DecadeGrowth As Double
   Dim InitialRussianFactor As Double


   Dim RowD As Integer
   Dim CIndexD As Integer
   Const Row0 = 40
   Dim fertility As Double
   Dim FertilitySpread As Double
   Dim NSample As Integer
   Dim MeanDecadeGrowth As Double
   Dim GrowthSpread As Double
```

```vba
    Public ActualDecadeGrowth(1 To ntime) As Double
    Public ActualFertility(1 To ntime) As Double

    Public Memory As Double
    Public choice As Integer

 Sub Main2()

' careful is you want growth spread to be less than zero!
    CIndexD = 2
    NSample = Worksheets("Sheet1").Cells(5, 21).Value
    Memory = Worksheets("Sheet1").Cells(5, 22).Value
    choice = Worksheets("Sheet1").Cells(5, 23).Value
    MeanDecadeGrowth = Worksheets("Sheet1").Cells(5, 17).Value
    GrowthSpread = Worksheets("Sheet1").Cells(5, 18).Value
    fertility = Worksheets("Sheet1").Cells(5, 19).Value
    FertilitySpread = Worksheets("Sheet1").Cells(5, 20).Value
    InitialRussianFactor = Worksheets("Sheet1").Cells(5, 16).Value
    Worksheets("Sheet1").Cells(25, 16).Value = InitialRussianFactor
    For n = 1 To NSample

        SingleSample
        XLSet_Population_D
        CIndexD = CIndexD + 1
    Next n
End Sub
Sub XLSet_Population_D()
' place the answers in the spreadsheet for the Russian, NonRussian and Total Populations
' use sheet number 2 and cycle through Columns
' now put the time in only once and put Russian, non Russian and Total on different rows
 For rwIndex = 1 To ntime
    RowD = rwIndex + Row0
    Worksheets("Sheet2").Cells(RowD, 1).Value = TotalTime(rwIndex)
    Worksheets("Sheet2").Cells(RowD, CIndexD + 1).Value = Russian(rwIndex)
    RowD = RowD + 1 + ntime
    Worksheets("Sheet2").Cells(RowD, CIndexD + 1).Value = NonRussian(rwIndex)
    RowD = RowD + 1 + ntime
    Worksheets("Sheet2").Cells(RowD, CIndexD + 1).Value = TotalPopulation(rwIndex)
    RowD = RowD + 1 + ntime
    Worksheets("Sheet2").Cells(RowD, CIndexD + 1).Value = NonRussian(rwIndex) /
(Russian(rwIndex))
    RowD = RowD + 1 + ntime
    Worksheets("Sheet2").Cells(RowD, CIndexD + 1).Value =
ActualDecadeGrowth(rwIndex)
    RowD = RowD + 1 + ntime
    Worksheets("Sheet2").Cells(RowD, CIndexD + 1).Value = ActualFertility(rwIndex)
```

```
 Next rwIndex
End Sub

Sub SingleSample()

   XLSet_Initial_Conditions
' now loop over time in steps of ten years (since that is the breakdown in the data)
   Dim time, timestep As Double
   time = 2002 ' initial time
   timestep = 10

   ChangePopulation  ' Estimate Russian and Non Russian Populations
   MySum
   Russian(1) = SumPopulation
   TotalTime(1) = 2002
   NonRussian(1) = (1# - InitialRussianFactor) * Russian(1) / InitialRussianFactor
   TotalPopulation(1) = Russian(1) + NonRussian(1)
   ActualDecadeGrowth(1) = 0
   ActualFertility(1) = 0
   For nt = 2 To ntime
      For i = 1 To Nx
         FertilityRate(i) = fertility + (Rnd(7) - 0.5) * FertilitySpread
            ' Don't allow negative fertility?
            ' or one could, but this would represent increased mortaility of younger people
            If (FertilityRate(i) < 0) Then FertilityRate(i) = 0#
      Next i
      DecadeGrowth = MeanDecadeGrowth + (Rnd(7) - 0.5) * GrowthSpread
      ActualDecadeGrowth(nt) = DecadeGrowth
      ActualFertility(nt) = fertility + (Rnd(7) - 0.5) * FertilitySpread
      If (nt > 2 And choice = 1) Then
' apply memory of previous value
         For i = 1 To Nx
            FertilityRate(i) = (1# - Memory) * FertilityRate(i) + Memory *
ActualFertility(nt - 1)
            ' Don't allow negative fertility?
            ' or one could, but this would represent increased mortaility of younger people
            If (FertilityRate(i) < 0) Then FertilityRate(i) = 0#
         Next i
         DecadeGrowth = (1# - Memory) * DecadeGrowth + Memory *
ActualDecadeGrowth(nt - 1)

         ActualDecadeGrowth(nt) = DecadeGrowth
         ActualFertility(nt) = FertilityRate(1)
      End If

      If (nt > 1 And choice = 2) Then
```

```
' apply memory of previous value; But change the average values
        fertility = (1# - Memory) * fertility + Memory * ActualFertility(nt)
        MeanDecadeGrowth = (1# - Memory) * MeanDecadeGrowth + Memory *
ActualDecadeGrowth(nt)
     End If


     If (nt > 2 And choice = 3) Then
' apply memory of previous value
        For i = 1 To Nx
           FertilityRate(i) = ((1# - Memory) * (Rnd(7) - 0.5) * FertilitySpread) + Memory
* ActualFertility(nt - 1)
           ' Don't allow negative fertility?
           ' or one could, but this would represent increased mortaility of younger people
           If (FertilityRate(i) < 0) Then FertilityRate(i) = 0#
        Next i
        DecadeGrowth = ((1# - Memory) * (Rnd(7) - 0.5) * GrowthSpread) + Memory *
ActualDecadeGrowth(nt - 1)

        ActualDecadeGrowth(nt) = DecadeGrowth
        ActualFertility(nt) = FertilityRate(1)
     End If



     time = time + 10
     UpdatePopulation
     MySum
     Russian(nt) = SumPopulation
     TotalTime(nt) = TotalTime(nt - 1) + 10#
     NonRussian(nt) = NonRussian(nt - 1) * (1# + DecadeGrowth)
     TotalPopulation(nt) = Russian(nt) + NonRussian(nt)
   Next nt


   XLSet_Population

End Sub

Sub UpdatePopulation()
Dim TotalBirths As Double
   For i = 1 To Nx
      Births(i) = FertilityFactor(i) * Female(i) * FertilityRate(i)
   Next i
   TotalBirths = 0#
   For i = 1 To Nx
      TotalBirths = TotalBirths + Births(i)
   Next i
```

```
   For i = 1 To Nx - 1
      Population(Nx - i + 1) = Population(Nx - i) * ContinuationFactor(Nx - i)
   Next i
   Population(1) = TotalBirths
   For i = 1 To Nx
      Male(i) = Population(i) * MaleSexRatio(i)
      Female(i) = Population(i) * FemaleSexRatio(i)
   Next i

End Sub


Sub MySum()
SumPopulation = 0#
For i = 1 To Nx
   SumPopulation = SumPopulation + Population(i)
Next i
End Sub
Sub ChangePopulation()
For i = 1 To Nx
   Population(i) = Population(i) * InitialRussianFactor ' probably an overestimate for the
small 0-9 population range
Next i
End Sub
Sub XLSet_Population()
' place the answers in the spreadsheet for the Russian, NonRussian and Total Populations
 CIndex = 2
 For rwIndex = 1 To ntime
   Row = rwIndex + 40
   Worksheets("Sheet1").Cells(Row, CIndex + 1).Value = Russian(rwIndex)
   Worksheets("Sheet1").Cells(Row, CIndex).Value = TotalTime(rwIndex)
   Worksheets("Sheet1").Cells(Row, CIndex + 2).Value = NonRussian(rwIndex)
   Worksheets("Sheet1").Cells(Row, CIndex + 3).Value = TotalPopulation(rwIndex)
 Next rwIndex
End Sub


Sub XLSet_Initial_Conditions()
 CIndex = MaleIndex
 For rwIndex = 1 To Nx
   Row = rwIndex + RwZero - 1
   Male(rwIndex) = Worksheets("Sheet1").Cells(Row, CIndex).Value
   Worksheets("Sheet1").Cells(Row + 20, CIndex).Value = Male(rwIndex)
 Next rwIndex
 CIndex = MaleSexRatioIndex
 For rwIndex = 1 To Nx
```

```
   Row = rwIndex + RwZero - 1
   MaleSexRatio(rwIndex) = Worksheets("Sheet1").Cells(Row, CIndex).Value
   Worksheets("Sheet1").Cells(Row + 20, CIndex).Value = MaleSexRatio(rwIndex)
 Next rwIndex
 CIndex = FemaleIndex
 For rwIndex = 1 To Nx
   Row = rwIndex + RwZero - 1
   Female(rwIndex) = Worksheets("Sheet1").Cells(Row, CIndex).Value
   Worksheets("Sheet1").Cells(Row + 20, CIndex).Value = Female(rwIndex)
 Next rwIndex
 CIndex = FemaleSexRatioIndex
 For rwIndex = 1 To Nx
   Row = rwIndex + RwZero - 1
   FemaleSexRatio(rwIndex) = Worksheets("Sheet1").Cells(Row, CIndex).Value
   Worksheets("Sheet1").Cells(Row + 20, CIndex).Value = FemaleSexRatio(rwIndex)
 Next rwIndex
 CIndex = TotalIndex
 For rwIndex = 1 To Nx
   Row = rwIndex + RwZero - 1
   Worksheets("Sheet1").Cells(Row + 20, CIndex).Value = Male(rwIndex) +
Female(rwIndex)
   Population(rwIndex) = Male(rwIndex) + Female(rwIndex)
 Next rwIndex
 CIndex = ContinuationFactorIndex
 For rwIndex = 1 To Nx
   Row = rwIndex + RwZero - 1
   ContinuationFactor(rwIndex) = Worksheets("Sheet1").Cells(Row, CIndex).Value
   Worksheets("Sheet1").Cells(Row + 20, CIndex).Value = ContinuationFactor(rwIndex)
 Next rwIndex
 CIndex = FertilityFactorIndex
 For rwIndex = 1 To Nx
   Row = rwIndex + RwZero - 1
   FertilityFactor(rwIndex) = Worksheets("Sheet1").Cells(Row, CIndex).Value
   Worksheets("Sheet1").Cells(Row + 20, CIndex).Value = FertilityFactor(rwIndex)
 Next rwIndex
 CIndex = FertilityRateIndex
 For rwIndex = 1 To Nx
   Row = rwIndex + RwZero - 1
   FertilityRate(rwIndex) = Worksheets("Sheet1").Cells(Row, CIndex).Value
   Worksheets("Sheet1").Cells(Row + 20, CIndex).Value = FertilityRate(rwIndex)
 Next rwIndex


End Sub

Sub Bubbles()
```

```
Charts.Add
ActiveChart.ChartType = xlXYScatterSmooth
ActiveChart.SetSourceData Source:=Sheets("Sheet2").Range("C53:C62"), PlotBy _
    :=xlColumns
ActiveChart.Location Where:=xlLocationAsObject, Name:="Sheet2"
With ActiveChart
    .HasTitle = True
    .ChartTitle.Characters.Text = "Non Ethnic Russians"
    .Axes(xlCategory, xlPrimary).HasTitle = True
    .Axes(xlCategory, xlPrimary).AxisTitle.Characters.Text = "Date"
    .Axes(xlValue, xlPrimary).HasTitle = True
    .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text = _
    "population (Millions)"
End With
ActiveChart.SeriesCollection(1).XValues = "=Sheet2!R41C1:R50C1"
ActiveChart.SeriesCollection(1).Name = "=""sample 1"""
ActiveChart.Axes(xlCategory).Select
With ActiveChart.Axes(xlCategory)
    .MinimumScale = 1990
    .MaximumScaleIsAuto = True
    .MinorUnitIsAuto = True
    .MajorUnitIsAuto = True
    .Crosses = xlAutomatic
    .ReversePlotOrder = False
    .ScaleType = xlLinear
    .DisplayUnit = xlNone
End With
ActiveChart.ChartArea.Select
ActiveChart.SeriesCollection.NewSeries


Dim XV As String
XV = "=Sheet2!R41C1:R50C1"
Dim V As String
Dim place As Integer
Dim Sample As String
Dim NSample As Integer


NSample = Worksheets("Sheet1").Cells(5, 21).Value

For n = 2 To NSample
    place = (n + 2)
    Sample = "sample " & n
    V = "=Sheet2!R53C" & place & ":R62C" & place
    ActiveChart.SeriesCollection.NewSeries
```

```vba
      ActiveChart.SeriesCollection(n).XValues = XV
      ActiveChart.SeriesCollection(n).Values = V
      ActiveChart.SeriesCollection(n).Name = Sample

   Next n

End Sub
Sub PlotGrowthRate()

   Charts.Add
   ActiveChart.ChartType = xlXYScatterSmooth
   ActiveChart.SetSourceData Source:=Sheets("Sheet2").Range("C86:C94"), PlotBy _
      :=xlColumns
   ActiveChart.Location Where:=xlLocationAsObject, Name:="Sheet2"
   With ActiveChart
      .HasTitle = True
      .ChartTitle.Characters.Text = "Decade Growth Rate"
      .Axes(xlCategory, xlPrimary).HasTitle = True
      .Axes(xlCategory, xlPrimary).AxisTitle.Characters.Text = "Date"
      .Axes(xlValue, xlPrimary).HasTitle = True
      .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text = _
      "Real Decade Growth Rate"
   End With
   ActiveChart.SeriesCollection(1).XValues = "=Sheet2!R42C1:R50C1"
   ActiveChart.SeriesCollection(1).Name = "=""sample 1"""
   ActiveChart.Axes(xlCategory).Select
   With ActiveChart.Axes(xlCategory)
      .MinimumScale = 1990
      .MaximumScaleIsAuto = True
      .MinorUnitIsAuto = True
      .MajorUnitIsAuto = True
      .Crosses = xlAutomatic
      .ReversePlotOrder = False
      .ScaleType = xlLinear
      .DisplayUnit = xlNone
   End With
   ActiveChart.ChartArea.Select
   ActiveChart.SeriesCollection.NewSeries


   Dim XV As String
   XV = "=Sheet2!R42C1:R50C1"
   Dim V As String
   Dim place As Integer
   Dim Sample As String
   Dim NSample As Integer
```

```
    NSample = Worksheets("Sheet1").Cells(5, 21).Value

    For n = 2 To NSample
        place = (n + 2)
        Sample = "sample " & n
        V = "=Sheet2!R86C" & place & ":R94C" & place
        ActiveChart.SeriesCollection.NewSeries
        ActiveChart.SeriesCollection(n).XValues = XV
        ActiveChart.SeriesCollection(n).Values = V
        ActiveChart.SeriesCollection(n).Name = Sample

    Next n
End Sub
Sub PlotFertilityRate()

    Charts.Add
    ActiveChart.ChartType = xlXYScatterSmooth
    ActiveChart.SetSourceData Source:=Sheets("Sheet2").Range("C97:C105"), PlotBy _
        :=xlColumns
    ActiveChart.Location Where:=xlLocationAsObject, Name:="Sheet2"
    With ActiveChart
        .HasTitle = True
        .ChartTitle.Characters.Text = "Russian Fertilty"
        .Axes(xlCategory, xlPrimary).HasTitle = True
        .Axes(xlCategory, xlPrimary).AxisTitle.Characters.Text = "Date"
        .Axes(xlValue, xlPrimary).HasTitle = True
        .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text = _
        "Total Fertility"
    End With
    ActiveChart.SeriesCollection(1).XValues = "=Sheet2!R42C1:R50C1"
    ActiveChart.SeriesCollection(1).Name = "=""sample 1"""
    ActiveChart.Axes(xlCategory).Select
    With ActiveChart.Axes(xlCategory)
        .MinimumScale = 1990
        .MaximumScaleIsAuto = True
        .MinorUnitIsAuto = True
        .MajorUnitIsAuto = True
        .Crosses = xlAutomatic
        .ReversePlotOrder = False
        .ScaleType = xlLinear
        .DisplayUnit = xlNone
    End With
    ActiveChart.ChartArea.Select
    ActiveChart.SeriesCollection.NewSeries
```

```vba
    Dim XV As String
    XV = "=Sheet2!R42C1:R50C1"
    Dim V As String
    Dim place As Integer
    Dim Sample As String
    Dim NSample As Integer


    NSample = Worksheets("Sheet1").Cells(5, 21).Value

    For n = 2 To NSample
        place = (n + 2)
        Sample = "sample " & n
        V = "=Sheet2!R97C" & place & ":R105C" & place
        ActiveChart.SeriesCollection.NewSeries
        ActiveChart.SeriesCollection(n).XValues = XV
        ActiveChart.SeriesCollection(n).Values = V
        ActiveChart.SeriesCollection(n).Name = Sample

    Next n
End Sub

Sub Bubbles_Total()
    Charts.Add
    ActiveChart.ChartType = xlXYScatterSmooth
    ActiveChart.SetSourceData Source:=Sheets("Sheet2").Range("C64:C73"), PlotBy _
        :=xlColumns
    ActiveChart.Location Where:=xlLocationAsObject, Name:="Sheet2"
    With ActiveChart
        .HasTitle = True
        .ChartTitle.Characters.Text = "Total Population"
        .Axes(xlCategory, xlPrimary).HasTitle = True
        .Axes(xlCategory, xlPrimary).AxisTitle.Characters.Text = "Date"
        .Axes(xlValue, xlPrimary).HasTitle = True
        .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text = _
        "population (Millions)"
    End With
    ActiveChart.SeriesCollection.NewSeries
    ActiveChart.SeriesCollection(1).XValues = "=Sheet2!R41C1:R50C1"
    ActiveChart.SeriesCollection(1).Name = "=""sample 1"""
    ActiveChart.Axes(xlCategory).Select
    With ActiveChart.Axes(xlCategory)
        .MinimumScale = 1990
        .MaximumScaleIsAuto = True
```

```vba
         .MinorUnitIsAuto = True
         .MajorUnitIsAuto = True
         .Crosses = xlAutomatic
         .ReversePlotOrder = False
         .ScaleType = xlLinear
         .DisplayUnit = xlNone
      End With
      ActiveChart.ChartArea.Select
      ActiveChart.SeriesCollection.NewSeries

      Dim XV As String
      XV = "=Sheet2!R41C1:R50C1"
      Dim V As String
      Dim place As Integer
      Dim Sample As String

      Dim NSample As Integer
      NSample = Worksheets("Sheet1").Cells(5, 21).Value

      For n = 2 To NSample
         place = (n + 2)
         Sample = "sample " & n
         V = "=Sheet2!R64C" & place & ":R73C" & place
         ActiveChart.SeriesCollection.NewSeries
         ActiveChart.SeriesCollection(n).XValues = XV
         ActiveChart.SeriesCollection(n).Values = V
         ActiveChart.SeriesCollection(n).Name = Sample

      Next n


      ActiveChart.Legend.Select
      Selection.Delete

End Sub
Sub Bubbles_Russian()

   Charts.Add
   ActiveChart.ChartType = xlXYScatterSmooth
   ActiveChart.SetSourceData Source:=Sheets("Sheet2").Range("C41:C50"), PlotBy _
      :=xlColumns
   ActiveChart.Location Where:=xlLocationAsObject, Name:="Sheet2"
   With ActiveChart
      .HasTitle = True
      .ChartTitle.Characters.Text = "Ethnic Russians"
      .Axes(xlCategory, xlPrimary).HasTitle = True
```

```
        .Axes(xlCategory, xlPrimary).AxisTitle.Characters.Text = "Date"
        .Axes(xlValue, xlPrimary).HasTitle = True
        .Axes(xlValue, xlPrimary).AxisTitle.Characters.Text = _
        "population (Millions)"
    End With
    ActiveChart.SeriesCollection(1).XValues = "=Sheet2!R41C1:R50C1"
    ActiveChart.Axes(xlCategory).Select
    With ActiveChart.Axes(xlCategory)
        .MinimumScale = 1990
        .MaximumScaleIsAuto = True
        .MinorUnitIsAuto = True
        .MajorUnitIsAuto = True
        .Crosses = xlAutomatic
        .ReversePlotOrder = False
        .ScaleType = xlLinear
        .DisplayUnit = xlNone
    End With
    ActiveChart.ChartArea.Select
    ActiveChart.SeriesCollection.NewSeries


    Dim XV As String
    XV = "=Sheet2!R41C1:R50C1"
    Dim V As String
    Dim place As Integer
    Dim Sample As String

    Dim NSample As Integer
    NSample = Worksheets("Sheet1").Cells(5, 21).Value

    For n = 2 To NSample
        place = (n + 2)
        Sample = "sample " & n
        V = "=Sheet2!R41C" & place & ":R50C" & place
        ActiveChart.SeriesCollection.NewSeries
        ActiveChart.SeriesCollection(n).XValues = XV
        ActiveChart.SeriesCollection(n).Values = V
        ActiveChart.SeriesCollection(n).Name = Sample

    Next n

    ActiveChart.Legend.Select


End Sub
Sub bub2()
```

```
    ActiveChart.ChartType = xlXYScatterSmooth
End Sub
Sub bub3()

    ActiveChart.Legend.Select
    ActiveChart.Legend.LegendEntries(11).Select
    Selection.Delete
End Sub
```

Appendix B: Graphs
Below are the graphs from a trial run of the program to serve as examples

Ethnic Russians

Total Population

Non Ethnic Russians

sample 1	sample 11
sample 2	sample 12
sample 3	sample 13
sample 4	sample 14
sample 5	sample 15
sample 6	sample 16
sample 7	sample 17
sample 8	sample 18
sample 9	sample 19
sample 10	

Decade Growth Rate

Russian Fertilty