

The Computed Scripture: Exponentially Based Fourier Regulated Construct of Quran and its Fundamentally Important Consequences

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Abstract

This is a fundamental article reporting newly observed mathematical-computational manifestations in Quran. The Principle Variations (PVs) for the purpose of textual analysis will be defined and a Normal Book model based on the stochastic nature of human writing will be developed. It will be shown that chapter word frequencies in Quran fit into an exponential model, in sharp contrast to the uniform distribution model commonly observed for other books. In particular, a phenomenal cross diagonal characteristic of the PVs in Quran will be shown to completely distinguish its exponential structure from observed structures of the world literature. Graphical and Parametric effects of the exponential construct of Quran will be shown through logarithmic plots and Fourier analysis of its PVs. The couplings observed from its variations in addition to an independent analysis of the prime numbers point to π and e , as pillars of the mathematical construct of Quran. Computed parameters of a Stepwise Fourier analysis (SF-analysis) of the PVs in Quran, reveals a finely regulated Nineteen Based Fourier Structure (NBFS) highly sensitive to the textual manipulations. These observations seem sufficient to qualify Quran as a case of (Multifaceted) Mathematically Fully Constrained Writing (MFCW), a concept defined for the first time in this article. As its prime consequence, a MFCW Quran points to the nonhuman origin of the Arabic language. Interesting observations are also made through the SF-analysis of particular names which can be indicative of an astonishing futuristic vision of Quran. The importance of such mathematical investigations particularly from the MFCW point of view will be emphasized and some relevant future studies will also be outlined.

Keywords: computed scripture, cross diagonal pvs, f-parameters, f-plots, fpv, ges, mfcw, mlf method, nbfs, normal book, principle variations, quran, sf-analysis

1. Introduction

1.1 Motivations and Background

The fact that universe is mathematical is best reflected in the strict formulations of physics which are essential to understanding and describing the physical phenomena. In fact, none of the technological achievements of our age would have been conceivable, had it not been for recognition and utilization of this remarkable mathematical order. The quotation attributed to Einstein (Collected Quotes), that "the most incomprehensible thing about the world is that it is comprehensible", is perhaps referring to this amazing mathematical establishment.

There are those who believe however, presuming that the Author of "the book of the universe" and "the book of revelation" be the same, it shouldn't be surprising to find mathematical orders of some sort also in the latter. From this point of view, possible mathematical manifestations in a scripture not only can be considered just in line with the grand mathematical tradition of a Supreme Creator, but also as a signature of authenticity for the scripture.

Interestingly though, what triggered this research work was not any preconceived notion of the sort but merely an "accidental" observation. In the late 80s, while in the final year of his Ph.D. studies, an English translation of Quran (Khalifa 1981) was given to this author. In the final pages of the book, tabulations of the chapter frequencies of two alphabetic letters in Quran were arranged in ascending order. Presumably, the author (translator) meant to show to the readers that certain letters had been used in Quran, certain number of times. However, it was not the frequencies of these alphabetic characters, but rather, the clear exponential manner in which these frequencies were increasing that appeared most unusual to this author. In a preliminary computer analysis of the chapter frequencies that followed, it became clear that in fact there is a lot more to these

observations than meets the eye.

As the investigation continued it not only became evident that intricate mathematical structures indeed existed in Quran but that they probably contained some intelligent messages. The bulk of these messages can be translated through the concept of MFCW or (Multifaceted) Mathematically Fully Constrained Writing. The concept of MFCW materialized as an inevitable consequence of the observed mathematical constructs, a concept that so far has gone largely unnoticed by those searching mathematical patterns in Quran. As will be seen, this concept will suggest some key answers concerning interesting questions, such as the origin of the Arabic language and timeless challenges of Quran.

Unfortunately, due to the lack of complete and reliable data and also because of some obstacles the research was halted one year after its start. The initial findings were never published officially but were circulated as a report among some university colleagues. Recently however, after a long period of suspended activity in the subject, the author was asked to present a university seminar about his original findings. The presentation which followed appeared interesting to the audience and the author was encouraged to publish the study.

In the course of preparation of this article during the last couple of years, new observations were also made so that the article is presented with much added content compared to its initial report form. In particular, since it was intended to show abnormalities in the textual structure of Quran, numerous comparisons with the human literature have been supplemented. Also, because such comparisons were unprecedented, a very simple but effective model for the textual structures was developed by the author.

Although this work is the result of a purely personal research activity, existence of an independent and reliable statistics of Quran (Madi, Quran Suras statistics) used for mathematical analysis presented in this article should by no means be overlooked. This is particularly important because Intellaren which is mainly a software producing company provides Quran statistics not for searching miracles but just to show the capabilities of a product for language analysis purposes. This is in fact, one of the strengths of the research presented in this article that contrary to many other works in Quran which use self produced or questionable statistics to prove their points, completely independent and systematically verifiable statistics is used for its analyses (note 1).

1.2 Quran for Mathematical Analysis

In its own right and as a well known scripture, Quran can be considered a prime candidate for mathematical scrutiny of its structure. Regardless of the history of its gathering and textual compilation, today there is only one widely accepted version of Quran which is written in its original Arabic (History of Quran). Also, as compared to other famous scriptures, Quran is the latest revealed scripture which makes it the least suspected of manipulations. In addition to these, Quran possesses a very unusual textual structure which attracts in the first sight the attention of its perceptive observers.

The peculiar structure of Quran can be seen from the word frequencies of its chapters as shown in Figure 1 (Madi, Quran Suras statistics, Revelation Order), which somehow resembles amplitude features of a damping oscillation. Strangely, the chronological revelation order of chapters looks completely different from the way chapters are observed in Quran, as is shown in Figure 1.

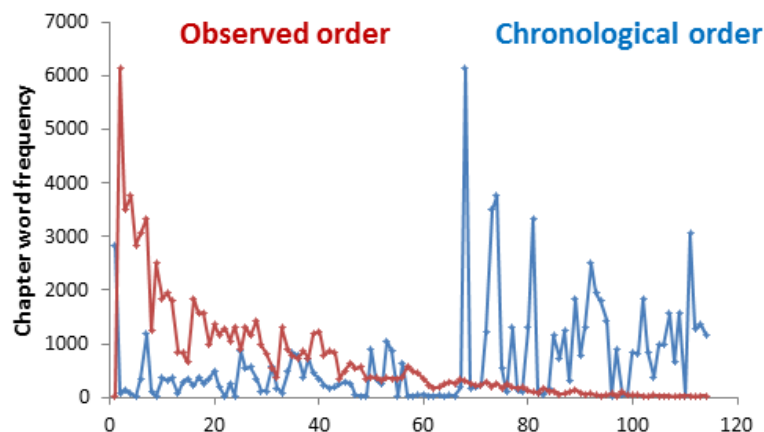


Figure 1. Observed and chronological orders of chapter word frequencies for Quran

Horizontal axis simultaneously shows observed and chronological orders.

On the other hand, there are verses in Quran, wherein with absolute confidence opponents of its divinity are

challenged to produce a book like Quran or even produce a similar chapter to one of its chapters (Quran, 17:88, 11:13, 2:23). Quran even goes as far as stating that such simulation attempts are forever doomed to failure (Quran, 2:24).

These challenges have mainly been attributed to the unique style of the language and eloquence of Quran (see for instance, Tzortzis, or web search under "challenges of Quran"). But, to a curious mind the question remains for instance, what indeed makes a 14 word chapter (chapter 108), which is the shortest chapter in Quran, forever irreproducible? The analysis presented in this article will provide some mathematical-computational clues to answer this and some other interesting questions.

1.3 Related Work

Almost all mathematical structures that so far have been claimed for Quran are local, non-encompassing, and integer structures. In other words, mainly integer-arithmetic patterns are claimed to have been observed and for certain words, certain letters, and in certain chapter(s), or verses. To see the numerous references for this, the interested reader may search the web, for instance under, "mathematical miracle of Quran".

It so seems that R. Khalifa has so far produced the most notable work concerning the integer numerical structure of Quran. Khalifa produces a long list of number (19) incidences in Quran (Khalifa, 1982), starting with the number of chapters which is $114=6 \times 19$, the opening statement which is composed of 19 letters, frequencies of initials, which for instance in chapters 42 and 55, both having the same initial qaf (ق), is $57=3 \times 19$ etc.,. Considering that probability of accidental occurrences of so many number (19) events is remote, Khalifa concludes that No19 is the mathematical code of Quran manifesting its divinity. In fact, integer number (19) manifestations are not so difficult to detect in Quran so that an observant person could have discovered many of them even hundreds of years ago (it is possible that this might have happened).

Khalifa also points to chapter 74 in Quran as the revealer of the secret mathematical code of Quran. As for the reason why (19) has been selected to be the mathematical code in Quran, he suggests a reason based on the numerical values of the Arabic alphabets (Khalifa, 1982). Unfortunately, a rather nonscientific conduct of Khalifa in the matter of 19 in Quran and his extravagant claims resulted in creation of a negative atmosphere around the mathematical studies of Quran as a whole.

In any case, despite his own claims, for surety Khalifa's No(19) integer structure of Quran by itself does not qualify to support the challenge of Quran for its timeless irreproducibility. This is true simply because today and with some effort a similar type number (N) scheme can easily be structured into any book with, or even without, a computer assisted bookkeeping of words and letters.

1.4 This Work

This work begins with a section devoted to the definition of Mathematically Fully Constrained Writing, a concept fundamental to all mathematical studies of Quran. This is a new concept presented for the first time in this article which considers the important implications of mathematical manifestations in a text. The MFCW sees all mathematical constructs embedded in the quantitative (note 2) structure of Quran as an integrated multifaceted mathematical construct. From this point of view, mathematical manifestations should be looked at as delicately computed constructs implemented for a greater purpose than just impressing their prospective observers as miracles.

To provide a ground for showing the exceptional engineering of word frequencies in Quran, the article proceeds by introducing some relevant definitions and concepts such as textual variations as necessary tools for systematic study of the textual structures. Based on the assumption of stochastic nature of human writing which is shown to be well supported by observations, a simple but effective normality model is developed to be used in comparison studies. More than twenty famous works of the world literature, mostly in their original languages, will then be used for a comparison with Quran. The comparison reveals for the first time, a phenomenal Cross Diagonal Effect in which the exponential tuning of the word frequencies in Quran is implicit, an observation in sharp contrast to what is normally observed for the human literature. Here, the General Exponential construct of Quran will pronouncedly be observed and will be studied in some details.

In the following section, individual frequency tunings of the two specific letters of the Arabic alphabet will be shown to establish a coupling between the two most fundamental natural (nature related) numbers π and e through strikingly clear graphical manifestations. The study of graphical effects will continue by exposing some interesting real-number, number (19) manifestations of the variations in Quran.

Next, the important sensitivity tests of structures will be defined to evaluate stability (or non-accidental nature) of the observed effects. This will be done by inducing deliberate manipulations and alterations in Quran.

Immediately following this, previously observed effects are put to test and the test results will be shown to strongly rule out accidental nature of the observed effects.

In a following analysis which evaluates the relative divisibility of integers to natural numbers π and e , it will be shown that 19 has the best relative divisibility to both π and e , which presents a plausible numerical reason for choosing 19 as the mathematical code for both, integer and real number construct of Quran. Based on this and coupling manifestations observed earlier, it is postulated that π and e are in fact the two pillars of the mathematical construct of Quran. From this point of view, the previously observed integer manifestations of number 19, as reported by Khalifa, can also be interpreted as an extension of a more general π - e mathematical foundation into the realm of integers.

The main differences between the mathematical structures presented in this article and those so far claimed by others including Khalifa, are:

- 1) Presented structures in this article are fully encompassing, real-number mathematical structures and adequately support the MFCW construct of Quran (include entire Quran, not just some sections of it) as opposed to, local non-encompassing integer mathematical structures.
- 2) Mathematical structures presented in this article, are advanced and of high level and differ much from simple integer structures that only require counting for their detection. In particular, Parametric NBFS effects can only be detected through sophisticated computational techniques and instrumentations (modern computers) that only very recently have become available.

2. MFCW: The Concept and the Consequences

We will now attend a very important subject introduced for the first time here in this article, the concept of MFCW, which implies composition of a whole book under fully encompassing mathematical constraints. Initially it was planned to raise this subject at the end of this article and after presentation of all observed mathematical effects in Quran. But later, it seemed more appropriate to discuss MFCW in the beginning because essentially it is an independent subject and also, it will give the readers a better sense of purpose and direction as they read the article through. Among its other important consequences, MFCW can provide a clue to what the challenge of Quran and its timeless irreproducibility, even for its shortest chapter, can mean after all.

2.1 MFCW: The Concept

Consider a book "B" which is written in a language "L", having any subject matter "S". Suppose in addition, that book B is also a standard of literary excellence in language L. Book B however, has a very special property in that every letter of alphabet and every word which is used in its writing conforms to at least one mathematical scheme which necessitates presence of that letter and word. In fact, this is an extreme case of a topic called "constrained writing" (Constrained writing-wiki). In order to see what paradoxical situation this can create and how it can be overcome consider the following example:

Suppose a brilliant writer be asked to describe in a few sentences, for instance, a natural scenery, but with the condition that a specific mathematical scheme be complied with in that writing, a scheme which for instance takes into account every letter in the writing. For example, the author can be demanded to keep the frequencies of all letters exactly equal to 8 in that writing. To make it even easier, suppose that the writer is given the freedom to choose any mathematical scheme that he or she can find for this writing. Even so, it is not very hard to guess that such an attempt is most probably doomed to failure and for the following obvious reasons: There are limited number of words which for instance mean mountain, cloud, sky etc., and also there is a grammar and some literary standards that forbid many combinations of words from being articulate and eloquent in that language. In other words, English or any other existing language cannot satisfy the requirements of a proposed mathematical structure simply because existing languages already have a well-defined vocabulary and construct that hardly permit implementation of such fully encompassing constraints. How is it then possible to write a whole chapter or entirety of a book like book B, with such fully encompassing mathematical restraints?

There seems to be a way however to get around this problem, but it requires that the existing language be modified or changed in some ways so that the given subject can be written consistent with the proposed mathematical scheme. Consider as a simple example the quotation attributed to Einstein: "Science without religion is lame. Religion without science is blind" (Collected Quotes). This quotation apparently shows no mathematical pattern in it but if we were asked to restate it with the constraint that every letter be used in it exactly 8 times, and if for simplicity we choose to use only 3 characters, one of the numerous possible ways to do this can look like this:

"DE EA AEA DA DED. AEA EA DE DA EDD",

With substitutions: "science" by "DE", "religion" by "AEA", "without" by "EA", "is" by "DA", "lame" by "DED", and "blind" by "EDD".

Notice from this simple example that without inducing much change in the English language and just by arbitrarily defining a few new words (although with awkward appearance!), we were able to comply with the given mathematical constraint. Nonetheless, through this process a few words in English had to be changed and obviously these changes must be enacted throughout the entire English literature. Suppose now that we gradually expand the subject, for instance by adding another Einstein quotation: "Imagination is more important than knowledge" (Collected Quotes) and demand that the same or a similar constraint be enforced. It is obvious that now we need to construct both quotations together and the first quotation will also need to be changed again. At this point our new vocabulary has expanded further and this will continue if we keep adding new quotations. At some stage in this expansion process, in order to stay compatible with the demanded mathematical constraints, we have had to make so many modifications and changes in the English language (both in words and perhaps in its grammar too) that it won't be English anymore!

The problem becomes much more complicated when the subject is the content of a whole book and not only one but several complex mathematical schemes simultaneously are demanded to be implemented in the quantitative structure of that book. The procedure in essence is the same as that which was used in the quotations example, but at a much greater depth and on a much larger scale. This operation can be carried out, perhaps by a team of mathematicians and linguists (definitely assisted by computers), and will involve extremely complicated computations constantly checked for their self consistency aimed at simultaneously expressing the subject, and at the same time complying with the given mathematical requirements. The result will be a book "B" that conveys the intended subject while satisfying the demanded mathematical scheme(s) but it will be in a completely new language with new words, new grammar and even new alphabetic characters: A completely new language "L" is born out of this particular mathematical scheme. It is clear that the rest of language L, for instance its other words, which lie outside the content of book B can be generated and expanded but of course, consistent with the contents and grammar of book B. Book B and quite justifiably so, can now be called "The Mother Book of language L" because this language is born out of, and is founded based on book B.

Although, it is true that these mathematicians and linguists have now succeeded to write a book B written in a newly invented language L, but there is yet a big question left. Even if language L be taught to some people, would book B sound impressive when it is read or heard by these people? For instance, if Hamlet of Shakespeare be chosen as the subject for the mother book B, will it have the same impact in language L as its original English version has on its native English speakers?

The lack of eloquence that can clearly be seen from the awkward looking translation in the quotation example, and which is not far from what an emotionless computer might generate, indeed poses a serious problem. This shows the importance of another factor in compilation of the book B which is absolutely essential in perfection of its construct; literary impact and eloquence.

So if the Mother book B in language L is also going to be literary impressive, the team of experts must also have a deep knowledge of human physical and emotional built and include it also in their compilation of the book B and its language L. In a full-control scenario which gives a much higher level of control to the team of experts they should have the ability and power to also change the human faculties (at least the vocal and hearing organs and brains of humans). As a similitude, consider the obvious fact that the makers of a computer must also be the makers of its language; otherwise, even the most structurally advanced computers won't be able to communicate with each other or with their programmers. Considering this similitude, and of course from a completely physical point of view, humans may be compared with computers, language L can be compared with a computer language and book B can be compared with a written program or software in that computer language, which when executed will produce certain intended results and outputs (e.g., impressing its audience).

With some further stretch of imagination, one can think of having the capability to manipulate and control the building blocks of matter at its deepest level. Elements and consequently the molecules must be possible to exist in such numbers and with such properties to render observed human construct complexities and characteristics. Imagine for instance, that just by changing one physical constant (e.g., the Planck constant) the number and properties of possible-to-exist elements will change and this in turn will affect the level of possible complexities and specificities of the resulting living things. At this farthest stretch of imagination, the structure of the mother book B may in some ways be linked to a "Master Creation Plan".

The above statements are of course expressed just as speculations; nonetheless, they can reflect the potential power and creative character of the author of such a mathematically constrained book B. The following

definition expresses a minimal condition for a book to qualify as a case of MFCW:

- A normal size book B which is known by speakers of its language L to be a masterpiece in that language is defined to be a MFCW if it complies with at least one fully encompassing mathematical structure that constraints the entirety of its quantitative construct including all its words, letters, etc.

Any additional fully or locally mathematical constraint found for this book will only add to its MFCW level of complexity (or to its multifaceted character) and will strengthen the arguments on behalf of the MFCW consequences. A list of important MFCW consequences as pertaining to Quran are given in sections 15.2 to 15.4 of this article. These consequences signify fundamental importance and necessity of such mathematical studies.

2.2 MFCW: The Prime Consequence

In a nutshell, the MFCW concept tells us that if a fully encompassing mathematical scheme is to be imposed on the quantitative construct of a text, then logically, it is the language of that text that should be constructed based on this mathematical scheme and the reverse is impossible (the mathematical scheme cannot be forced onto an already existing language). Based on the presented concepts of the MFCW the following can be postulated.

- The prime MFCW consequence: The Mother book B and its language L must be the result of a single and simultaneous act of creation (compilation).

In this article, and for the first time, existence in Quran of two real number structures, though not completely independent of one another, will be shown which are fully encompassing the entirety of the quantitative construct of Quran and can in fact be viewed as two facets of a multifaceted mathematical structure of Quran. Obviously all observed mathematical facets, be them integer or real, fully encompassing or local, discovered or to be discovered, should all be considered as results of a grand integrated mathematical design. In other words, different structures although are observed through different manifestations, as we shall soon see, cannot be seen as independent. All observed or to be observed mathematical structures in Quran, are intricately interconnected with each other through an extremely complex and delicate engineering of the elements of the language requiring unimaginably high computational capability with the utmost precision and optimization aimed at balancing all observed mathematical and verbal effects.

The two structures that are main subjects of this article will be recognized through their logarithmic effects as observed from their respective plots, and through Fourier analysis of the frequency variations of verses, words, letters, and names in Quran, these are:

- 1) General Exponential Structure (GES), manifested through its logarithmic graphical effects.
- 2) Nineteen Based Fourier Structure (NBFS), manifested through its computed parametric effects.

Before entering these subjects, however, we need to define some concepts and develop some tools needed for the systematic analysis of textual structures.

3. Textual Variations - Definitions and Concepts

Considering that in a book the frequency of words and other units of language varies from one chapter to another, the word "Variation" has been adopted in this article to show such dependencies. Of course, in a broader sense variations can also be defined for shorter than chapter, such as for paragraphs and sentences but in this article we will focus only on the chapter variations.

The Natural Variation (NV) of words $w(i)$ for a book (with the lowercase w), is defined as the word frequency vs. the chapter number " i ".

The Sorted Variation (SV) of words $W(n)$ (with the uppercase W), is defined as $w(i)$ s sorted in ascending order, where " n " here represents the order of smallness such that, $W(n) \leq W(n+1)$.

These definitions can be generalized to include other units of language such as letters of alphabet, sentences, etc. For instance, $t(i)$ would represent the Natural Variation, and $T(n)$ represents the Sorted Variation of letter " t " in a given book. Figure 2 shows simultaneous plots of both the Natural and Sorted Variations of words for Dickens' novel Great Expectations (American Literature Classics Library).

Other variations may also be defined such as Chronological Variation (Chapters of a scripture arranged in order of revelation). The Natural Variation represents the author arranged or the actual sequence of the chapters in a book. The Sorted Variation, however, has its own statistical importance as we shall soon see and it is unique in that it is independent of any initial chapter arrangement. Because of their fundamental importance, the two Natural and Sorted Variations in this article shall be defined as the "Principle Variations" or PVs of the textual structure.

In Figure 2 we also show "Frame of the Principle Variations" (FPV) which is the minimum size rectangle fully encompassing PVs. The width of the FPV is equal to $m-1$, m being the number of chapters in the book, and its height is equal to $(W_{\max} - W_{\min})$, where W_{\min} and W_{\max} represent the minimum and maximum word frequencies, respectively.

The Domain Ratio for words is also defined as:

$$D_w = \frac{W_{\max}}{W_{\min}} \quad (1)$$

where this definition too, can be generalized to include other units of the language.

Figure 2b shows the logarithmic plot of Figure 2a, where the logarithmic FPV can also be seen. The height of the Logarithmic FPV is of course equal to logarithm of the Domain ratio. For instance, for *Great Expectations*, $D_w=7.38$ (see Table 1).

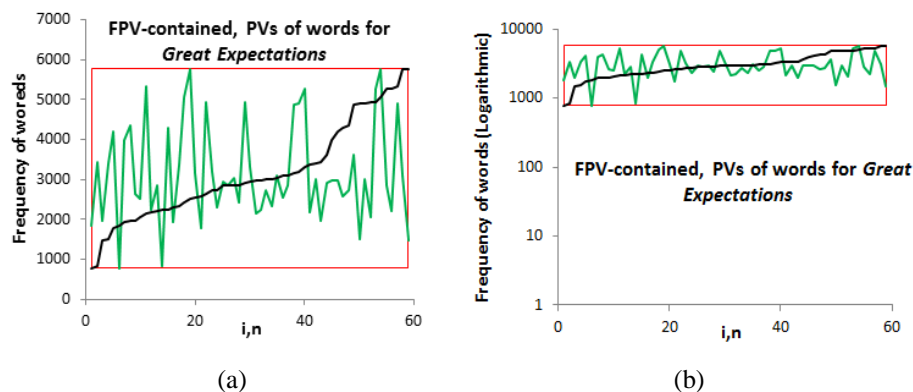


Figure 2. Plot of the Principle Variations of words for the novel *Great Expectations* as enveloped in its FPV
Horizontal axis simultaneously represents i , as the chapter number for the NV, and n as the sort rank for the SV
(NV in green, SV in black, FPV in red)

4. Typical Textual Structure - The Normal Book Concept

The question of what makes a book to be considered structurally normal may not be an easy one to answer but if we are to detect abnormalities then we also need to have some criterion for normality. The noise like Natural Variation observed for *Great Expectations* in Figure 2 can provide a hint as to what such criterion might be. Even without having seen this example, one could have guessed intuitively, that the structure of a typical or a "Normal Book", be it in any language and in any subject matter, insofar as the lengths of its chapters are concerned should be stochastic at best. This can be expected because authors are primarily concerned about the content of their writing rather than its length. Statistically speaking, however, this means that chapter sizes in a normal book obey a uniform distribution (Uniform distribution). To be more exact, it can be stated that; the word frequency of a chapter in a normal book is expected to assume any value with equal probability, between a minimum (the word content of the shortest chapter) and a maximum (the word content of the longest chapter).

Of course, such stochastic distribution can be expected so far as the authors exert no conscious control over the size of the chapters in writing their books. In reality though, some authors may choose to have a few very long or very short chapters. Also, the duration of writing, author's psychological ups and downs and many other factors can contribute to the writing process and thereby to the book structure. Therefore, deviations from normality can be expected but in general as we shall see, the stochastic model accounts well for the majority of human writings.

In practice, there are number of ways to check the uniformity of distribution for a given set of numbers but perhaps the simplest way is to verify the linearity of the sorted arrangement of these numbers. In fact it can be rigorously proven in Order Statistics, that the expectation values of a sorted series of random numbers should lie on a straight line (Lerma 2005, David & Nagaraja, 2003, P.80). This property can also be seen experimentally; by generating a set of random numbers and plotting their sorted values (e.g. see Figure 3). In its simplest form, this linearity can be checked by visual observation but it can also be checked by least squares fitting of a straight line to the sorted data values whereby a quantitative judgment can be made based on the R-sq (R-squared)

computed for the fitted line.

4.1 Normal Book Simulation and Normality Relation

Random numbers obey a uniform distribution so they can be used to simulate chapter word frequencies for a Normal Book. We have used a random number generator on the web (Random.org), to simulate a sample Normal Book having $m=100$ chapters with its chapters containing from a minimum of 1000 to a maximum of 5000 words.

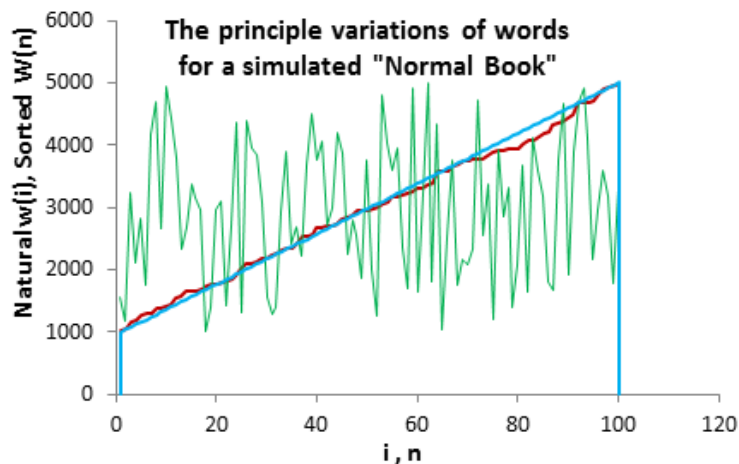


Figure 3. PVs of words for a Normal Book with 100 chapters, simulated by a random number generator

The Normality Relation is obtained by computing the area of the shown trapezoid (in blue)

It can be seen from Figure 3 that the Natural Variation $w(i)$ which is plotted in green, clearly shows a stochastic behavior (repeated random number generations have all produced very similar results) but the Sorted Variation $W(n)$ plotted in red, shows a relatively perfect linear trend as is expected of the sorted arrangement of a set of random numbers. Comparing the similarities of Figure 2a and Figure 3, one can better observe the stochastic characteristics of a typical book structure. We will now use this simulation to derive a simple but useful relation.

The observed linear trend of the Sorted Variation gives us an approximate relation between W_{total} , the total word content of a Normal Book and the sizes of its minimum W_{min} , and its maximum W_{max} chapters. Consider in Figure.3 that the area under the straight line connecting the extreme points of the Sorted values, almost equals the total word content of the book. So the following simple approximate relation to be called the "Normality Relation" can be derived where, as before, m is the total number of chapters in the book:

$$(W_{\text{min}} + W_{\text{max}}) m \cong 2W_{\text{total}} \quad (2)$$

This useful relation can be used to compute (estimate) one unknown, if other three parameters are known. This relation will be used, as will be seen, to simulate Normal Qurans.

This relation can also be used to make some estimates for real books with nearly uniform distribution, for instance, one can estimate the total word content of a book, just by knowing the minimum and maximum size chapters in that book. In fact, we will just do this to compute the predicted Normal Book content of all books used in comparison studies presented in this article (see Table 1).

5. The General Exponential Structure of Quran (GES)

Words are undoubtedly the most important units of the language and this in turn gives study of their Principle Variations a prime importance. We begin to present the observed mathematical effects in Quran, starting first with its Principle Variations of words.

5.1 Observation of the Phenomenal Cross Diagonal Effect in Quran

Observe in Figure 4, a most prominent manifestation of the exponential tuning of the both Principle Variations in Quran. Compare Figure 4 with Figure 2 of the Great Expectations which in fact represents a typical example for the world literature. Particularly notice in Figure 4b, how well both the NV and SV arms coincide with the

diagonals of the FPV.

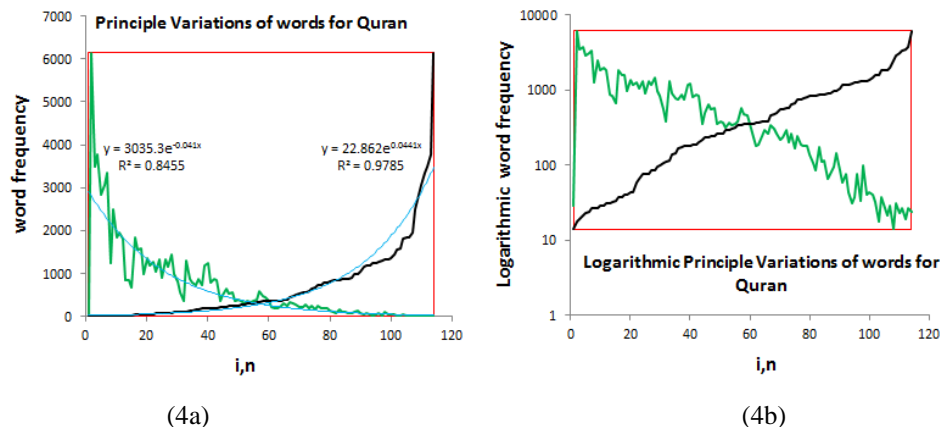


Figure 4. FPV-enveloped Principle Variations of words for Quran (NV in green, and SV in black).

Least squares fitted exponentials (blue curves) with their computed equations and R-sq values are also shown in 4a

The Diagonal Crossing of the Principle Variations in Quran has resulted from a delicate exponential engineering of not only the relative word frequencies in the Sorted Variation, but also from a proper sequencing of the chapters in the Natural Variation.

The phenomenal exponential tuning of the PVs in Quran will not be fully appreciated unless a thorough comparison is made with those of the world literature. But before making such comparison, we will make a structural comparison of Quran and "Normally Simulated Qurans".

5.1.1 Comparison Between Principle Variations of the Real and Simulated Qurans

In this section we will simulate three Qurans all with the same total content and with the same size shortest chapter but with Normal Book structures. We will then compare their PVs with that of the real Quran:

1) Using the Normality Relation we can see what Quran might have looked like if its 114 chapter sizes obeyed a uniform distribution. Taking W_{total} , W_{min} , and m , the same as in real Quran we can compute from Equation 2: $W_{max} = 1359$. Knowing the minimum and maximum size chapters we can compute the expected intermediate chapter sizes by linear interpolation. In this way we now have the complete Sorted Variation from which and by a proper randomization of the orders, we can generate a sample Natural Variation for our first Normally Simulated Quran.

2) Using again the Normality Relation but this time with the assumption of having W_{total} , W_{min} , and W_{max} the same as in real Quran we can compute our second Normally Simulated Quran obviously with fewer chapters. The number of chapters for such Quran computes as $m=25$ from Equation 2, and by using the same procedure that was used in the 1st case we can make its corresponding PVs.

3) Finally, we make a third Simulated Quran which exactly has the same chapters as in real Quran, only with randomly changed sequence of chapters. This can easily be done using a randomization or "shuffling" procedure (note that there can be 114 factorial possibilities for such simulations). This simulation will have the same SV but of course a different NV as compared to the real Quran (in a sense, this is a semi-Normal Simulation because the chapter sizes do not obey a uniform distribution).

Figure 5, shows PVs of the 3 Simulated Qurans and the real Quran in the same graph. As can be seen, PVs of Normal Simulations of Quran show nothing even close to a Cross Diagonal which is observed for the real Quran. This is obvious because the linear SVs shown as straight lines in green and blue in Figure 5a, which are characteristic of a uniform distribution, always bend in their logarithmic plots, and can never represent a straight SV-diagonal in their FPV (compare Figures 5b and 4b). Also, the stochastic features of the Natural Variations in all three Simulated Qurans can never transform in their logarithmic plots into a relatively well shaped NV-diagonal for their FPVs as it happens for the real Quran (compare logarithmic NVs in Figure 5b).

We will now proceed to compare the Principle Variations of words observed for Quran, with its counterpart PVs observed for the world literature.

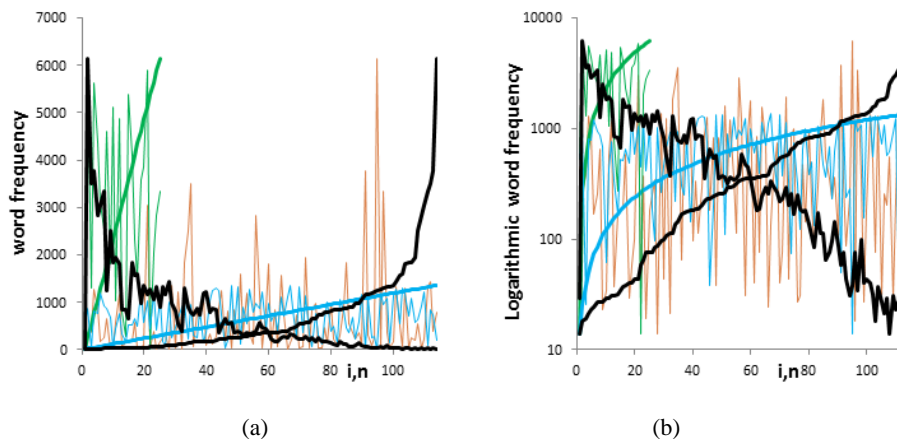


Figure 5. Principle Variations of words for simulated and real Qurans

1st Simulation shown in blue, 2nd Simulation shown in green and 3rd Simulation is shown in brown with the real Quran shown in black. Note that the third simulation has the same SV as the real Quran.

5.1.2 Comparison between Principle Variations of Quran and World's Literature

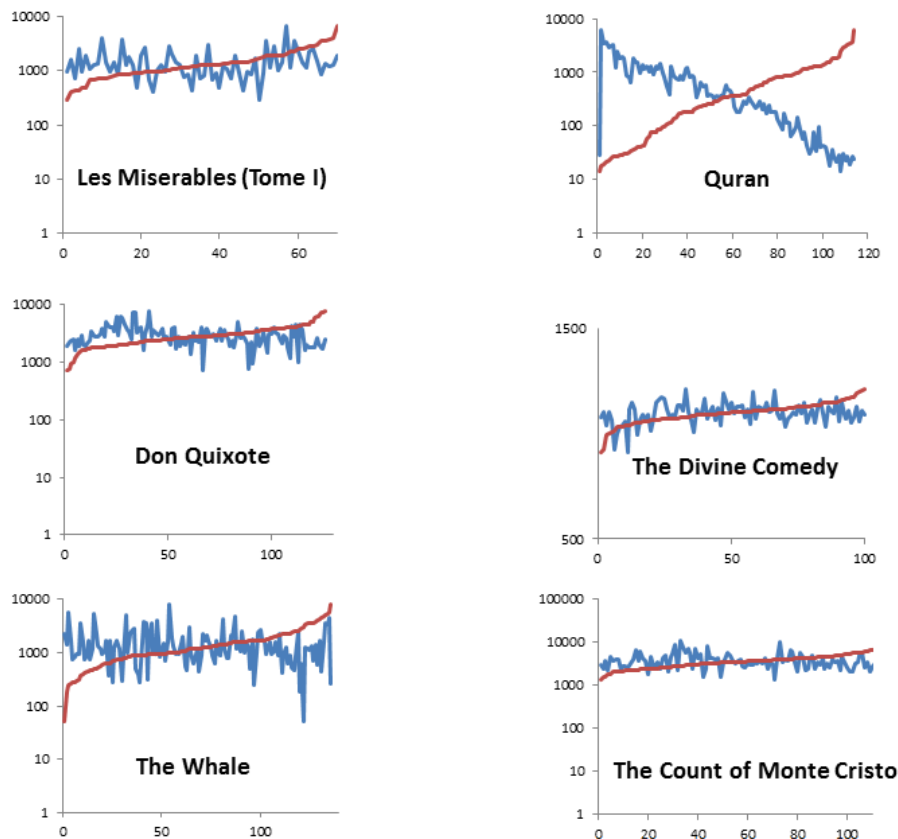


Figure 6. One-to-one comparisons of the logarithmic plots of the Principle Variations of words

PVs of Quran and 5 other books all in their original languages are compared. The vertical axis shows Logs of the chapter word frequencies and the horizontal axis shows simultaneously, i for the NVs (plotted in blue), and n for the SVs (plotted in red). The FPs have been omitted from these graphs.

Figure 6 shows separate plots of the logarithmic PV's for Quran and 5 other books while Figures 7 and 8 show simultaneous plots of the PVs for Quran and those of 21 other books. These books have been randomly selected from some of the world's greatest literature, all in their original language with three as English translations. These works have been accessed mainly through the Gutenberg library and a word counter on the web (Word Counter) has been used to count word frequencies of their chapters. It should be mentioned here, that there has been no particular preference in selecting these books other than presenting a rather wide range of literary works to be compared with Quran.

The possible objection that Arabic literature should not be compared with the western literature is not valid in this case, because the stochastic nature of human writing which is meant to be shown here is completely language and culture independent. This fact is clearly evident from structural similarities of literal works in 4 different European languages shown in Figure 6. Therefore, it would be quite unreasonable to claim that while in most cultures writings (as far as chapter word frequencies are concerned) have normal structures, in some other cultures writings might have exponential structures.

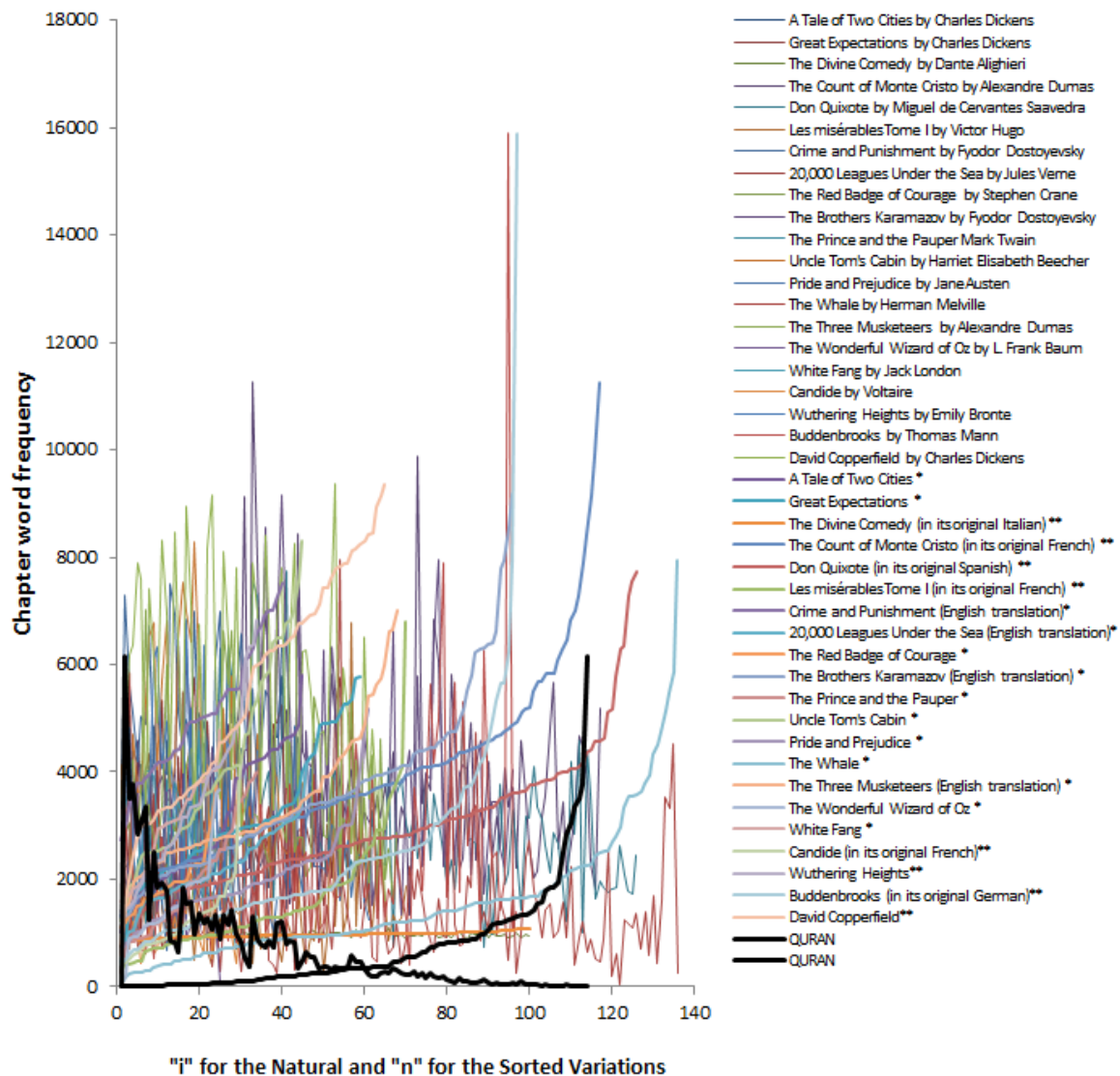


Figure 7. Simultaneous plots of the PVs of words for Quran and 21 works of the world literature
Color thick lines showing the SVs, and color thin lines showing the NVs (both PVs for Quran are plotted in black)

* Data extracted from: Free ebooks by Project Gutenberg.

** Data extracted from: American Literature Classics Library.

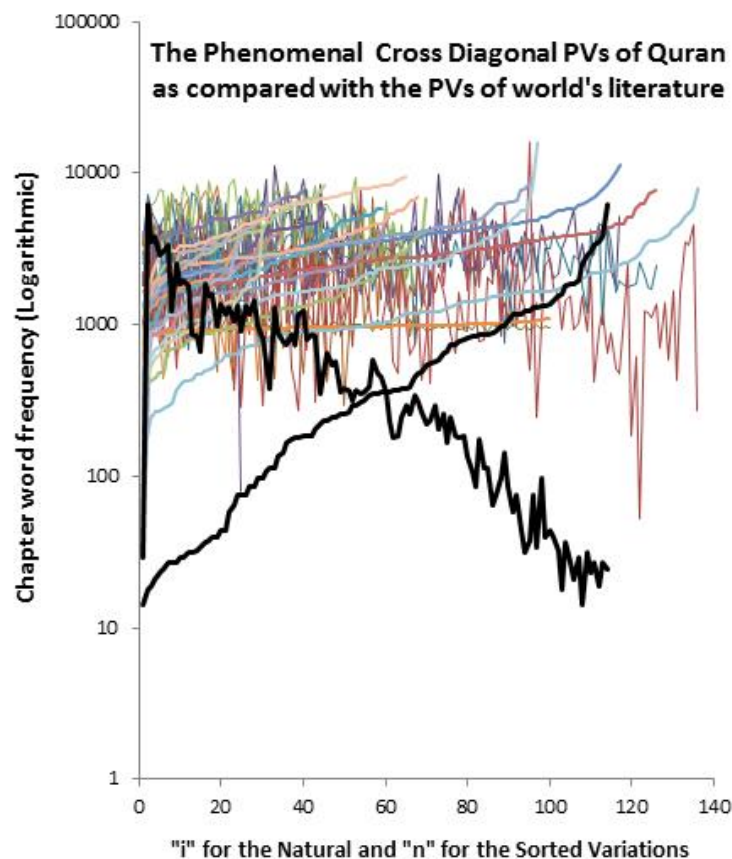


Figure 8. Logarithmic plot of Figure 7

A striking picture showing the unique exponential engineering of the Cross Diagonal Principle Variations of words in Quran, as compared to the Principle Variations of a sample of 21 human written books.

Although Figures 6-8 are quite self explanatory, it would be interesting to analyze the Cross Diagonal effect of the PVs in Quran in some details. In Table 1 some comparative statistics and computed parameters relevant to this analysis are presented.

Consider first that all Natural Variations including those of the simulated Qurans, show stochastic behavior throughout their ranges, a fact also reflected in their logarithmic plots. Notice from these Figures that even for those books with couple of very long or very short chapters, after omission of these unusual chapters the uniform distribution will be prevalent.

The main difference between the NV of words in Quran with the NV of words in other books is its exponential trend indicated by its comparatively high R-sq value of 0.85 compared to very poor R-sq values computed for others (first column in Table 1). Also, in Table 1 compare the exponent value of -0.04 computed for the exponential fit of the NV for Quran with the exponent values of 0.00 computed for the books with comparable large number of chapters.

As for the SVs, it can be seen from the plots of the Sorted Variations in Figure 7 that a good linear trend is observed for most works. This can also be seen from relatively high values of the linear fit R-sq values computed for the SVs of these representatives of the world literature. This linearity of the SVs in works of the world literature causes, just like the SVs for the 1st and 2nd simulations of Quran, a bending feature in their logarithmic plots which prevents their SV arms from showing a straight SV-diagonal in their FPV.

Concerning the SV of words in Quran, we can see from Table 1 that, it has the highest relative R-sq value computed for the exponential trend as compared to its low 0.6 value computed for the linear trend. It is true however, that any limited range straight line can be approximated with an exponential trend with a relatively high R-sq value, and vice versa. This fact can be seen for instance, from the relatively high value of R-sq=0.81

for the exponential trend fitted to the SV of the 1st simulated Quran with $\ln(Dw)=4.58$, a simulation with an absolutely linear trend with $R\text{-sq}=1.00$ (see Table 1). What makes Quran exceptional in this respect, not only is its largest value $\ln(Dw)=6.08$, as seen from Table 1, but its sustained exponentiality throughout a large number of 114 data points (chapters) in this range.

Table 1. Statistical comparison of the Principle Variations of Quran with those of other studied books

| BOOK | R^2 | Exponent | R^2 | R^2 | Exponent | W min | W max | m | Aver | Median | % of error | Ln(Dw) |
|-----------------------------|------------------|------------------|---------------------|------------------|------------------|----------|----------|-----|--------------|---------|------------|-------------|
| | Computed | Computed | Computed | Computed | Computed | | | | -age | chapter | for | |
| | for the | for the | for the | for the | for the | | | | chap | size | Computed | |
| | exp-fit to NV | exp-fit to NV | linear fit to SV | exp-fit to SV | exp-fit to SV | | | | -ter size | | Wtotal | |
| Quran | 0.85 | -0.04 | 0.60 | 0.98 | 0.04 | 14 | 6144 | 114 | 348 | 686 | 349 | 6.08 |
| Simulated Quran No.1 | 0.00 | 0.00 | 1.00 | 0.81 | 0.02 | 14 | 1359 | 114 | 686 | 686 | -2 | 4.58 |
| Simulated Quran No.2 | 0.02 | -0.03 | 1.00 | 0.64 | 0.14 | 14 | 6144 | 25 | 3079 | 3079 | 2 | 6.08 |
| Simulated Quran No.3 | 0.01 | 0.00 | 0.60 | 0.98 | 0.04 | 14 | 6144 | 114 | 348 | 686 | 349 | 6.08 |
| A Tale of Two Cities | 0.02 | 0.00 | 0.96 | 0.96 | 0.03 | 1008 | 5799 | 45 | 2574 | 3028 | 12 | 1.75 |
| Great Expectations | 0.00 | 0.00 | 0.92 | 0.89 | 0.02 | 785 | 5763 | 59 | 2955 | 3147 | 4 | 1.99 |
| The Divine Comedy | 0.04 | 0.00 | 0.89 | 0.88 | 0.00 | 785 | 1090 | 100 | 968 | 965 | -3 | 0.33 |
| The Count of Monte Cristo | 0.02 | 0.00 | 0.80 | 0.94 | 0.01 | 1337 | 11251 | 117 | 2955 | 3890 | 62 | 2.13 |
| Don Quixote | 0.08 | 0.00 | 0.81 | 0.90 | 0.01 | 737 | 7743 | 126 | 2764 | 2959 | 43 | 2.35 |
| Les misérables Tome I | 0.00 | 0.00 | 0.70 | 0.93 | 0.03 | 293 | 6792 | 70 | 1279 | 1533 | 131 | 3.14 |
| Crime and Punishment | 0.01 | 0.00 | 0.97 | 0.96 | 0.02 | 2735 | 7513 | 40 | 5010 | 5069 | 1 | 1.01 |
| 20,000 Leagues Under Sea | 0.02 | 0.00 | 0.93 | 0.82 | 0.03 | 449 | 4144 | 46 | 2097 | 2175 | 6 | 2.22 |
| The Red Badge of Courage | 0.18 | -0.02 | 0.83 | 0.92 | 0.04 | 1112 | 3754 | 24 | 1859 | 1950 | 25 | 1.22 |
| The Brothers Karamazov | 0.01 | 0.00 | 0.85 | 0.95 | 0.01 | 1306 | 9159 | 96 | 3403 | 3636 | 44 | 1.95 |
| The Prince and the Pauper | 0.01 | 0.01 | 0.96 | 0.93 | 0.06 | 268 | 4010 | 34 | 1791 | 1958 | 9 | 2.71 |
| Uncle Tom's Cabin | 0.11 | -0.01 | 0.94 | 0.97 | 0.03 | 1242 | 8300 | 45 | 3641 | 4048 | 18 | 1.90 |
| Pride and Prejudice | 0.15 | 0.01 | 0.78 | 0.90 | 0.02 | 675 | 5179 | 61 | 1835 | 1998 | 47 | 2.04 |
| The Whale | 0.02 | 0.00 | 0.69 | 0.89 | 0.02 | 52 | 7955 | 136 | 1201 | 1544 | 159 | 5.03 |
| The Three Musketeers | 0.05 | 0.00 | 0.85 | 0.87 | 0.02 | 785 | 7008 | 68 | 2953 | 3368 | 16 | 2.19 |
| The Wonderful Wizard of Oz | 0.06 | -0.03 | 0.84 | 0.66 | 0.09 | 80 | 3674 | 25 | 1440 | 1578 | 19 | 3.83 |
| White Fang | 0.04 | -0.01 | 0.97 | 0.95 | 0.04 | 1596 | 4781 | 25 | 3053 | 2966 | 8 | 1.10 |
| Candide | 0.07 | 0.02 | 0.70 | 0.93 | 0.05 | 427 | 4126 | 30 | 1065 | 1221 | 86 | 2.27 |
| Wuthering Heights | 0.02 | -0.01 | 0.94 | 0.98 | 0.04 | 1417 | 6838 | 34 | 3258 | 3428 | 20 | 1.57 |
| Buddenbrooks | 0.20 | 0.01 | 0.54 | 0.91 | 0.02 | 411 | 15890 | 97 | 1777 | 2354 | 246 | 3.65 |
| David Copperfield | 0.03 | -0.01 | 0.98 | 0.83 | 0.02 | 592 | 9363 | 65 | 5944 | 5484 | -9 | 2.76 |

1st and 2nd columns show the R-sqs and Exponents computed for the exponential function least squares fitted to the NVs. The 3rd column shows the R-sqs computed for the straight line least squares fitted to the SVs. The 4th and 5th columns show R-sqs and Exponents computed for the exponential function least squares fitted to the SVs. The last column shows the logarithmic Domain Ratios computed in base e (all decimals have been rounded to the first two significant digits).

As another test of the sustained exponentiality of the observed SV in Quran, consider that if we were given a set of data points which exactly fitted an exponential function, no matter how many of these data points we use, the R-sq computed for their exponential trend will always compute as 1.0. Figure 9 shows computed R-sq values for the exponential fits to Quran and to four other books comparable in the number of chapters with Quran. Observe how by omitting the chapters from the high end of the SVs (omitting the largest chapters) other books show significant changes in their exponential trend R-sqs, while Quran maintains almost a constant high value $R\text{-sq}\approx 0.98$ even after omission of 70% of its chapters (it is interesting to note that omission of 40-50 chapters from any selection of chapters in Quran leaves this R-sq almost completely unchanged).

Another indicator shown in Table 1, is the total words computed from the Normality Relation, Equation 2. Here, while taking every parameter in Equation 2 the same as in the actual book, the total word content W_{total} (predicted), is computed and compared to the actual word content W_{total} (actual) of the book.

Percentages of errors in Table 1 are obtained using the following relation:

$$\% \text{ error} = 100 \times [W_{\text{total}}(\text{predicted}) - W_{\text{total}}(\text{actual})] / W_{\text{total}}(\text{actual}) \quad (3)$$

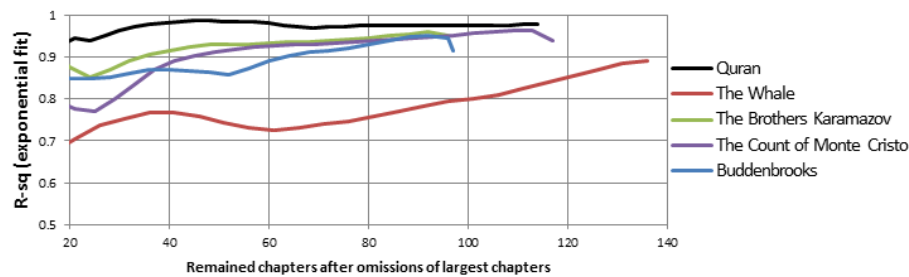


Figure 9. R squared values

R squares Computed for the exponentials fitted to the Sorted Variation of words for Quran and for 4 other books, as largest chapters are continually omitted from these books.

A lower percent in Table 1 would correspond to a better conformity to the Normal Book structure. It is seen that although 13 out of 21 or 62% of the books (not including the simulated Qurans) with less than 25% error, and 16 out of 21 or 76% with less than 50% error, show predictability by the Normality Relation. Quran with a huge 349% error shows the greatest deviation from a Normal Book structure.

Comparison of the averages (Means), and the Medians (see the statistical definitions for these) also shows the greatest relative difference for Quran (note that for the uniform distribution, Average=Median).

In summary, the phenomenal Cross Diagonal effect observed in the logarithmic plots of the Principle Variations of words for Quran is the result of the followings:

- Persistent exponential tuning of the Sorted Variation (actually by regulation of the relative word frequencies) sustained throughout just over 6 orders of logarithmic magnitude and for a large number of 114 points (Table 1).

This is obvious from the linear trend of its logarithmic plot which is in sharp contrast with the expected trend of a uniform distribution. In particular, this tuning shows itself through the careful regulation of the smaller size chapters in Quran, that is, chapters with less than the median of 348 words, which is smaller than majority of W_{\min} values observed for the world literature, as can be seen from Table 1.

- Independent exponential tuning of the Natural Variation, again throughout just over 6 orders of logarithmic magnitude and for 114 data points, as indicated by a relatively well sustained linearity observable in its logarithmic plot. This too, is sharply contrasted with the stochastic distribution of the chapter sizes expected of a uniform distribution. In a nutshell:

Implicit in Cross Diagonal Effect observed for the Principle Variations of words in Quran, is the sustained exponentiability of both its Principle Variations, in sharp contrast to the human written literature, where stochastic behavior for the Natural Variations and linear behavior for the Sorted Variations are considered as "normal" or expected behaviors.

5.2 Graphical Coupling Effects in Quran

The Cross diagonal Effect observed for the PVs in Quran is not limited to the variations of words but other units of language in Quran also show similar characteristics. This of course may be attributed as a natural consequence to the Principle Variations of words, since the frequency of letters and verses can be assumed proportional to the word frequencies. In fact, although the proportionality does exist to a great extent, but Variations also show their own individualities.

Figure 10 shows consecutive PV plots for 11 letters of the Arabic alphabet and also PVs for the verses and total letters in Quran. Table 2 shows in its first two columns, the 28 characters of the Arabic language with their English pronunciation (Arabic alphabet). In column 3 of Table 2, relative percentages of usage of these letters in entire Quran are also indicated.

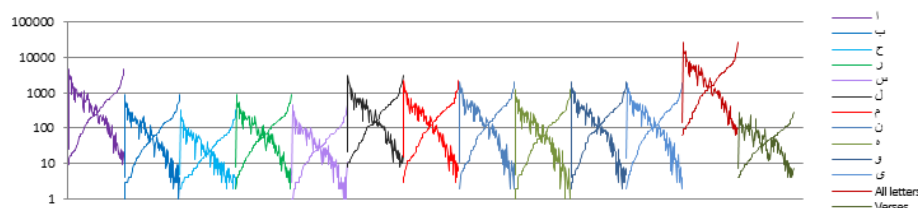


Figure 10. Logarithmic Principle Variations

PVs are shown of the indicated letters of alphabet, total letters, and verses in Quran. Widths for all PVs are the same (114 points). Logarithmic gridlines are indicative of the magnitude differences of chapter frequencies for different PVs.

Notice now, another very interesting graphical feature of the tunings of Variations in Quran: Observe from Figure 10, that for almost all the PVs a relatively complete cycle of oscillation (a sinusoidal wave), seems to have been superimposed on the SV and NV arms. This cycle of oscillation is especially more evident in the Sorted Variations and it can better be observed if the SV-diagonals (the line joining the two ends of the SVs) be drawn. The period of this oscillation coincides with the FPV height or log of D, the corresponding Domain Ratio for that Variation.

For two of the alphabetic letters however, the height of the FPVs or $\ln(D)$ which is the observed period of oscillation coincides with a striking value. Observe now from Table 2, that the FPV height of the logarithm in the base e, is 6.29 for alif (الف), and is 6.31 for qaf (ق).

Figure 11 shows plots of the SV arms and the SV-diagonals for both these letters. The shape of the sinusoidal wave appears to be much smoother in the case of letter qaf, although it has some missing points in the low end (corresponding to the chapters with no qafs). The heights of the blue and red curves, as seen on the vertical axis, are seen to be equal to $\ln(D) \approx 2\pi$.

Table 2. Symbols and some relevant statistics of the 31 Sorted Variations in Quran

| English | Arabic | % of All | $\ln(D)$ | $\text{Logten}(D)$ | $\ln(D)-2\pi$ | $\text{Log}(D)-e$ | lumped |
|---------|---------|----------|----------|--------------------|---------------|-------------------|--------|
| alif | ا (الف) | 18.4 | 6.288 | 2.731 | 0.0 | 0.0 | * |
| beh | ب | 3.5 | 6.823 | 2.963 | 0.5 | 0.2 | - |
| teh | ت | 3.9 | 7.078 | 3.074 | 0.8 | 0.4 | * |
| theh | ث | 0.4 | 4.852 | 2.107 | -1.4 | -0.6 | - |
| jim | ج | 1.0 | 5.298 | 2.301 | -1.0 | -0.4 | - |
| ha | ح | 1.3 | 5.106 | 2.217 | -1.2 | -0.5 | - |
| kha | خ | 0.8 | 5.252 | 2.281 | -1.0 | -0.4 | - |
| dal | د | 1.8 | 6.127 | 2.661 | -0.2 | -0.1 | - |
| dhal | ذ | 1.5 | 5.799 | 2.519 | -0.5 | -0.2 | - |
| ra | ر | 3.8 | 6.082 | 2.641 | -0.2 | -0.1 | - |
| zin | ز | 0.5 | 4.673 | 2.029 | -1.6 | -0.7 | - |
| sin | س | 1.8 | 6.114 | 2.655 | -0.2 | -0.1 | - |
| shin | ش | 0.6 | 5.124 | 2.225 | -1.2 | -0.5 | - |
| sad | ص | 0.6 | 5.043 | 2.190 | -1.2 | -0.5 | - |
| dad | ض | 0.5 | 4.890 | 2.124 | -1.4 | -0.6 | - |
| ta | ط | 0.4 | 4.595 | 1.996 | -1.7 | -0.7 | - |
| dha | ظ | 0.3 | 4.127 | 1.792 | -2.2 | -0.9 | - |
| ain | ع | 2.8 | 6.681 | 2.901 | 0.4 | 0.2 | - |
| ghain | غ | 0.4 | 4.317 | 1.875 | -2.0 | -0.8 | - |
| feh | ف | 2.6 | 6.621 | 2.876 | 0.3 | 0.2 | - |
| qaf | ق | 2.1 | 6.315 | 2.743 | 0.0 | 0.0 | - |
| kaf | ك | 3.2 | 6.724 | 2.920 | 0.4 | 0.2 | - |
| lam | ل | 11.6 | 5.993 | 2.603 | -0.3 | -0.1 | - |
| mim | م | 8.1 | 6.595 | 2.864 | 0.3 | 0.1 | - |
| nun | ن | 8.2 | 6.918 | 3.004 | 0.6 | 0.3 | - |

| | | | | | | | |
|---------|---------|-------|-------|-------|------|------|---|
| heh | ه | 4.5 | 7.088 | 3.078 | 0.8 | 0.4 | - |
| waw | و | 7.7 | 6.959 | 3.022 | 0.7 | 0.3 | * |
| yeh | ي | 7.8 | 6.856 | 2.977 | 0.6 | 0.3 | * |
| letters | كل حروف | 100.0 | 6.049 | 2.627 | -0.2 | -0.1 | * |
| words | كلمات | - | 6.084 | 2.642 | -0.2 | -0.1 | - |
| verses | آيات | - | 4.273 | 1.856 | -2.0 | -0.9 | - |

Arabic alphabet symbols with their English pronunciations, Percentages of use in Quran, logarithmic Domain Ratios, $\ln(D)$ and $\text{Logten}(D)$ (computed in base 10) as rounded to the first 3 significant decimals, and their differences from 2π and e , as rounded to the first decimal point are shown. Also, * means that the letter has been lumped (Madi, A study of Arabic letter). Note that statistics of the opening statement have been included in this Table.

Here we are observing a strikingly meaningful graphical association of a complete cycle of oscillation with a period of 2π . The observed periods of 6.29 and 6.31 are, with less than half percent deviation, equal to 2π . Consider now that these values for the periods are absolutely base dependent that is to say:

■ Only and only when the logs are taken in base e , the height of the FPV which is also the observed period, $\ln(Dw)=2\pi$.

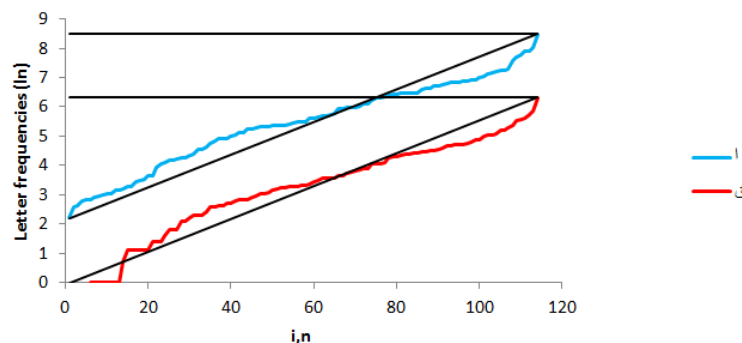


Figure 11. Natural log plots of the sorted Variations for letters 'ا' (alif) and 'ق' (qaf)

Observe how the SV arms show a complete cycle of oscillation about their SV-diagonals associated with a striking period of 2π (the height of the SVs as measured from the y axis).

This is a *Graphical Coupling of the two fundamental natural numbers* resulted from an independent engineering of the two alphabetical letters alif (probably because it is the initial for Allah, the most celebrated name of God in Quran), and qaf (probably because it is the initial for Quran). In order to see how only these two letters have been singled out for this remarkable manifestation observe values of FPVs for other characters from Table 2 and notice in particular that alif and qaf have the minimal differences (0.0) between their $\ln(D)$ values and 2π .

Observe now another very interesting manifestation which results from the particular selection of the 2π value for the latter observation: If instead of taking the logs in base e , the logs be taken in another popular base 10 we observe as is seen from Table 2, that $\text{Log}(D) = 2.73$ for الف, and $\text{Log}(D) = 2.74$ for ق, again with less than one percent deviation, coinciding with e . This matching of $\text{Log}(D)$ with e of course results only from a mathematical conversion factor from base e to base 10; nonetheless, a proper choice of D has made this manifestation possible. So again:

■ Only and only when the logs are taken in the popular base 10, the FPV height equals to e .

Notice again, from Table 2 the accuracies of tunings for these two letters compared to other letters.

So the following statement can generalize the remarkable Fundamental's Coupling Effects observed for the Principle Variations of alif and qaf:

■ Logarithmic plots of the Principle Variations of letters "alif" and "qaf" in Quran manifest the Graphical Couplings of the two most fundamental natural numbers π and e , only and only when the two most popular bases namely, e and 10 are used as bases for the logarithms.

5.3 Number (19) Graphical Effects

From Table 2, we can see that $\ln(D)$ for words, total of all letters, and for lam (the second most frequently used letter in Quran) is roughly equal to 6 (see Table 2). This means that on the average, every 19 steps in "i" the amplitude of the Natural Variation for NVs is attenuated by a factor of e . Also, on the average, the amplitude of the Sorted Variations for these quantitative units is amplified, e times, roughly every 19 steps in "n". In other words, if the exponential trend for the NVs be approximated by an equation of the type (4), and the exponential trend for the SVs be approximated by an equation of the type (5), as in the following:



Figure 12. Optimal containment of the logarithmic PVs of words observed for base (19)

Optimal containment of the logarithmic PVs of words in Quran is observed for base 19 (with gridlines in red) as compared to other integers next to 19. Gridlines corresponding to logarithmic positions of five consecutive integers, 17, 18, 19, 20, and 21 have been shown. Bottom five gridlines showing powers of 1, middle five gridlines showing powers of 2, and top five gridlines showing powers of 3 (color identifiable).

$$y(i) \cong A B^{(i/\alpha)} \quad (4)$$

$$Y(n) \cong A B^{(n/\alpha)} \quad (5)$$

then, with $B=e$, for the Natural Variation the attenuation constant is $\alpha \approx -19$, and for the Sorted Variation the amplification constant is $\alpha \approx 19$. Since the exponential model for these PVs has already been verified in section 5.1, this establishes a simultaneous coupling between 19 and e for these 3 major PVs. As a physical similitude, consider that α represents the number of steps required for 1dB attenuation or amplification of the corresponding Variation.

Noting another interesting manifestation of 19 in the FPV for words in Quran, we can see that the crossing point of the two Principles for words very nearly corresponds to the value 19×19 . See from Figure 12, which is a re-plot of the figure 4b, that not only the crossing point at $i=n=60$ very nearly lies on the 19×19 line, but also, the FPV height shows a relatively optimum containment between 19 at the bottom, and $19 \times 19 \times 19$ at the top, as compared to other integers next to 19. This observation is of course noticeable, only in the logarithmic plot.

5.4 Tests of the Effect Sensitivities

In this section the tuning precision of the observed Graphical effects will be subjected to test to see how susceptible they are to deliberate manipulations in Quran. Before doing that however, we will define a systematic Sensitivity test to be used throughout this article for all observed effects.

Quite literally, there are infinite ways to change frequencies of the words and other units of the language in chapters of a book which makes a through test of the textual structure seem virtually impossible. However, simple standard test methods can be defined as in the followings.

5.4.1 Permutation Test

This test is applicable to the manifestations observed for the Natural Variations and consists simply of alteration of 2 or more chapter positions in the book. This test will have absolutely no effect on manifestations observed for

the Sorted Variation since the SVs are independent of the initial arrangement of Chapters.

5.4.2 Subtraction/Addition Test

This test is applicable to the manifestations observed in both Natural and Sorted Variations and shows the effect of adding a positive or a negative constant to all chapter frequencies.

5.4.3 Multiplication Test

This test too, is applicable to the manifestations observed in both Natural and Sorted Variations, and shows the effect of multiplying frequencies of all chapters by the same constant.

5.4.4 The Permutation Test of the Cross Diagonal Effect

Permutations of only a few chapters suffices to induce deformations in the Natural Variation of words and thereby the straightness of the NV arm of the FPV and very probably changing the crossing point originally observed at $i=n=60$ (Figure 12), that is simultaneous disappearance of 5.1, and 5.3 effects. As an extreme example of the devastating effect of such permutations, compare the NV of the third simulated Quran in Figure 5b with the NV of real Quran in that same figure.

5.4.5 The Subtraction/Addition Test of the Cross Diagonal Effect in Quran

Figure 13 shows FPV of words for real Quran and 5 other manipulated Qurans resulted from Addition of -10, -5, 0, +30, + 60, and +100 words to every chapter of Quran, as is color-identified at the right side of the Figure 13. Observe in particular the constant downshift, or "meltdown", of the lower half of the NV-SV crossings as words are continually added to chapters of Quran. Notice how the general curvature of both NV and SV arms change sign as words are added from left to right. The zero average curvature or "straightness" appears to have been established for the real Quran in black. This test shows in particular, the important role of small size chapters in the exponential engineering of the Principle Variations in Quran.

Observe that in Figure 13, the heights of the FPVs are constantly shrinking from left to right and notice how this makes the effects observed in Figure 12, to vanish on both sides of the real Quran. This also shows the critical role of the small size chapters in determination of $\ln(Dw)$ values, and not only for the PVs of words, but also for all other observed PVs in Quran.

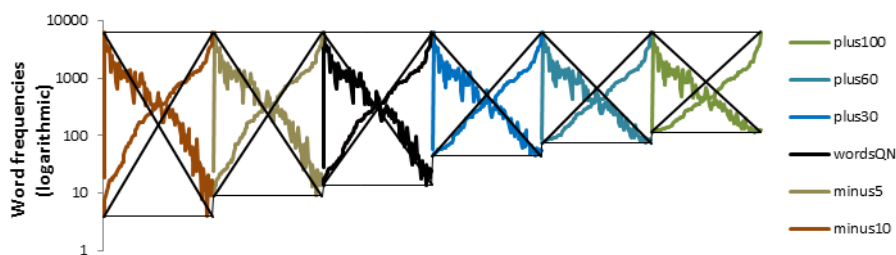


Figure 13. Subtraction/Addition test of the Cross Diagonal effect sensitivity

Notice the continual shrinking of the lower half of the Principles' crossing relative to their upper half as words are added to Quran. The optimized match (or overlap) of the Principle arms with the FPV diagonals happens for the original Quran (in black). The FPV height of $\ln(Dw) \approx 6$ observed for the real Quran, can be seen to have changed drastically in the manipulated Qurans.

5.4.6 The Multiplication Test of the Cross Diagonal Effect

If the PVs in a book be multiplied by a positive constant C , the only effect observed will be translational movement of the logarithmic PVs upward for $C > 1$, and downward for $C < 1$. So multiplication will only abolish the central "19×19" crossing coincidence seen in Figure 12. This shows that the exponential regulation of the PVs in Quran, as far as only the Graphical effects are concerned, can be accomplished by tuning of the relative frequencies alone.

5.4.7 Sensitivity Tests of the Graphical Coupling Effects in Quran

Since the coupling effects are observed only for the Sorted Variations and as we saw, multiplication will have no effect on the periods observed, we will just subject the SVs to the Subtraction/Addition tests.

5.4.8 The Subtraction/Addition Test of the Graphical Coupling Effects Observed for Letter Qaf

Figure 14 shows the Sorted Variation of letter qaf subjected to this test. Observe that the optimized configuration where the best shape of the sinusoidal wave, its period (2π), and coincidence of the SV arm with the SV-diagonal of the FPV is maintained, is seen to have best established for the real Quran (shown in red). Observe how when -6, +2, +4, and +6 qafs are added to each chapter, the period value of $\ln(Dq) \approx 2\pi$, is completely vanished, in addition to vanishing sinusoidal wave features in +4 and +6 graphs. Also notice in graphs of -2 and -4 added qafs, that although the period = $\ln(Dq) = 2\pi$, but the wave shape and coincidence of the SV arm with the SV-diagonal is not good.

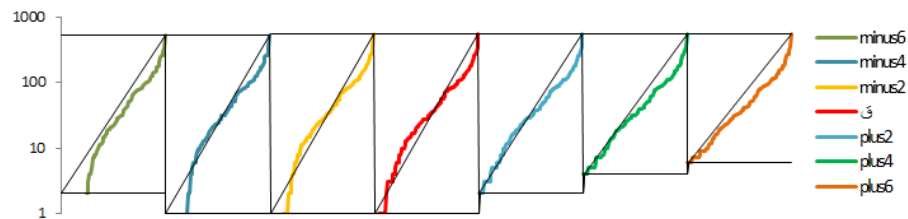


Figure 14. Subtraction/Addition effect sensitivity test of the Sorted Variation of letter qaf

Colors indicate number of qafs added to, or subtracted from each chapter in Quran. The log ticks are shown in the base 10, but the height of the FPV (the period) for the real Quran corresponds to 2π in base e and it can be used as reference for comparison of other FPV heights.

5.4.9 The Subtraction/Addition Test of the Graphical Coupling Effects for Letter Alif

Figure 15 shows the Sorted Variation of letter *alif* subjected to the Subtraction/Addition test. Observe again, that the optimized configuration with its 2π period, the best shape of the sinusoidal wave, and coincidence of the SV arm with the SV-diagonal of the FPV is seen for the real Quran (shown in blue). Observe how in all manipulated Qurans the height of the FPV completely misses the crucial 2π value, essential to observe the coupling effect.

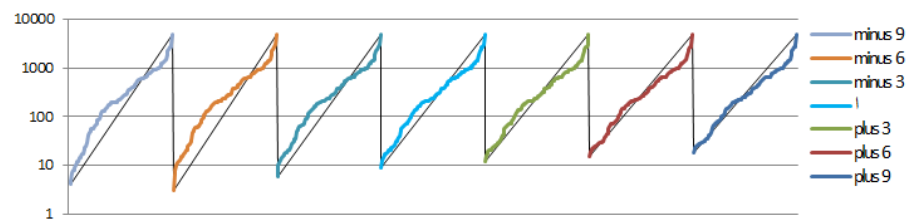


Figure 15. Subtraction/Addition effect sensitivity test of the Sorted Variation of letter alif

Explanations are the same as Figure 14 (full FPVs are not shown in this graph, only their heights and SV-arm diagonals are plotted).

In order to better see the critical role of the smallest frequency chapter in computing the FPV height (2π manifestation) Table 3 shows computation of the periods for a smaller range of one by one change in the Subtraction/Addition test of the Sorted Variation of letter alif in Quran. The shortest chapter has 9, and the largest chapter has 4844 alifs in Quran. As can be seen addition or subtraction of only one letter alif, to and from, each chapter in Quran has significantly changed the period $6.288 \approx 2\pi$, observed for $\ln(\text{Dalif})$ in real Quran (in fact, changes in the minimum frequency alone is sufficient to make the 2π period effect disappear).

Table 3.

| letteral manipulation (top row) | alif-3 | alif-2 | alif-1 | alif | alif+1 | alif+2 | alif+3 |
|---------------------------------------|--------|--------|--------|--------------|--------|--------|--------|
| $\ln(\text{alif, minimum frequency})$ | 1.792 | 1.946 | 2.079 | 2.197 | 2.303 | 2.398 | 2.485 |
| $\ln(\text{alif, maximum frequency})$ | 8.485 | 8.485 | 8.485 | 8.486 | 8.486 | 8.486 | 8.486 |
| $\ln(\text{Dalif,})$ | 6.693 | 6.539 | 6.406 | 6.288 | 6.183 | 6.088 | 6.001 |

Computed logarithmic min & max frequencies of letter alif resulted from changing the number of alifs in Quran from -3 to +3. The bottom row shows the observed periods (resulted from subtraction of the top 2 rows).

The necessity to include "بسم الله الرحمن الرحيم" (the opening statement) in the statistics of Quran can be seen in these tests of the Graphical effects. This statement contains 3 alifs in it which if not counted will make the $\ln(\text{Dalif})=6.693$ (see Table 3) absolutely demolishing the 2π coupling effect. It also has 4 words which if not counted will destroy the FPV height of 6 (3rd Graphical effect) and to some degree harms the central crossing effect at 19×19 . Inclusion of the opening statement will be seen as absolutely detrimental, when we will Fourier analyze the Principle Variations and will observe how a ± 1 change of letters can have dramatic effects on the computed parameters.

6. Divisibility Analysis of Integers: Number (19) Prominence

Much has been said in formal and non-formal literature about the role of number (19) in numeric-integer construct of Quran which is out of the scope of this article. But since this article presents a real-number analysis of the mathematical structure of Quran, it is only appropriate to present here a real-number analysis that shows the mathematical significance of this prime number, particularly in its relation to the fundamentals discussed. The importance of this number in mathematical engineering of Quran will become much more evident in the Fourier analysis of the PVs in Quran, where numerous numbr19 couplings will be seen to unveil a high level multifaceted mathematical structure superbly embedded in the quantitative construct of Quran. The following analysis will provide at least a partial clue to why number (19) has been so respected in Quran and has been singled out for many of mathematical manifestations in this scripture.

There is no integer divisible to π or e , because these are transcendental numbers. This does not mean however, that some integers are not "better divisible" to these numbers. We will now use the following very simple method to determine the relative divisibility of numbers to π and e :

Let n be any integer then compute n/π and round it to its closest integer, n_π . Now, compute the absolute value:

$$\Delta_\pi(n) = |n - \pi n_\pi| \quad (6)$$

Doing exactly the same for e we get:

$$\Delta_e(n) = |n - e n_e| \quad (7)$$

Plotting (6) and (7) vs n , we can see as their minimums, which integers have better relative divisibility to e and π . Now, to see which integers show better relative divisibility to both, π and e , we can add the two equations (6) and (7) and the minima of (8) will show integers with better relative divisibility to both these fundamentals:

$$\Delta_{\pi e}(n) = \Delta_\pi(n) + \Delta_e(n) \quad (8)$$

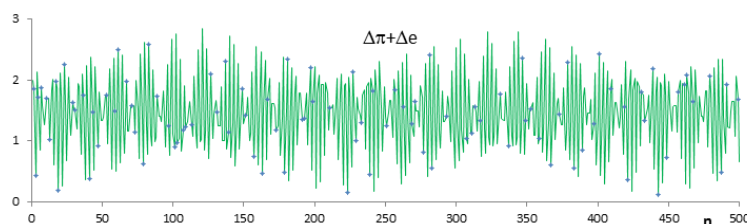


Figure 16. Plot of $\Delta_{\pi e}(n)$ vs. n

Integers from 1 to 500 are all used for computations while blue dots indicate prime numbers.

As can be seen, the first major minimum in this graph corresponds to number 19, the second major minimum corresponds to 223, and the third major minimum corresponds to 443. If a number were to be chosen proportionate to the size of Quran and unique in the sense that it represents (contains) better than any other number these two fundamental numbers, the choice should be 19. This number had to be a prime number because otherwise, its explicit prominence would have been undermined by its prime divisors (for instance, $21=7 \times 3$ does not uniquely represent number 21 but it also represents numbers 3 and 7).

It is interesting to note that, if only the prime numbers be considered, even if multiplication be taken instead of the summation of relations 6 and 7, we still get 19 as the first number with best divisibility to both π and e . Figure 17 shows in red, the inverse value of $\Delta_{\pi e}(n)$, and shows in blue the inverse values of $[\Delta_\pi(n) \times \Delta_e(n)]$. From Figure 17, we see that the first prominent maximum in both graphs corresponds to 19, with no other integer matching it up to $n=193$ in (a), and up to $n=223$ in (b).

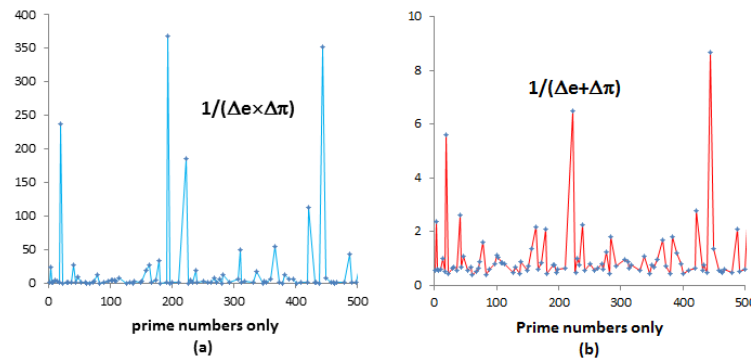


Figure 17. Plots of $1/[\Delta_{\pi}(n) + \Delta_e(n)]$, and $1/[\Delta_{\pi}(n)\Delta_e(n)]$

Both plots show the computed values for all prime numbers between 0 and 500.

Consider now the approximate relation $19 \cong 6\pi \cong 7e$, and note the interesting fact that both 19 divisors of π and e , namely 6 and 7, are also two very distinguished and important numbers in Quran (see for instance, Quran71:15, and 50:38).

7. Pi and e: Two Pillars of the Mathematical Construct of Quran

Based on the observations and analyses presented so far in this article and also what has been reported already by Khelifa and others, concerning the integer 19 schemes in Quran (not to mention chapter 74 indications), it can be speculated that in fact, integer 19 construct of Quran is an extension of a more general π - e foundation of its mathematical construct into the realm of integers. Therefore, it can be stated that:

- Two fundamental numbers, pi and e, either directly or indirectly (through number 19) have been chosen as pillars of the mathematical constitution of Quran.

These numbers are so important that mathematicians, physicists, and engineers put them at the top of their any list of the most significant numbers. Pi and e are also transcendental numbers, so even probable extraterrestrial intelligent beings would recognize these numbers, a completely appropriate choice by Quran of the two most important numbers absolutely fundamental to any mathematical description of the physical universe.

We will now introduce and define an analysis that will consistently be used to reveal a very delicate parametric regulation of the Principle Variations in Quran. We will use a Stepwise Fourier series analysis of its variations to show a truly amazing parametric regulation of verses, words, letters, and "names" in Quran.

8. The NBF Structure of Quran

8.1 Fourier Analysis of the Principle Variations in Quran

Initially, the idea of Fourier analysis of the Variations in Quran stemmed from observation of the oscillatory features superimposed on the basically linear trends, clearly seen in the logarithmic plots of its Sorted Variations. The simple idea was, to include in equation (5) the oscillatory features in the form of Fourier waves, (as a physical similitude consider for instance, standing waves inside a closed cavity) and see what parameters, A and α would compute in presence of these wave features. Consequently, a Stepwise Fourier analysis was performed on the Sorted Variation of letter qaf (ق). This analysis which from now on will be termed as the SF-analysis showed a very interesting evolution of the computed parameters as Fourier terms were continually added to the regression equation. The computed parameters not only were showing values which were multiples of 19, but even more striking was to see that inducing minimal changes in the number of letter qafs in Quran had devastating effects on these manifestations. Consequent application of the SF-analysis to other Principle Variations revealed similar manifestations indicating an extremely delicate regulation of both the chapter frequencies and the chapter orders in Quran. This structure of Quran which is primarily based on number (19) shall be called, the "Nineteen Based Fourier Structure" (NBFS).

8.2 Stepwise Fourier analysis of the Principle Variations: The SF-analysis

As a mathematical model for both PVs in Quran, consider an exponential function in the form

$$y_j(X) = A_j B^{\phi_j(X)} \quad (9)$$

$$\varphi_J(X) = \frac{x}{\alpha_J} + \sum_{m=1}^j \left(a_{jm} \cos \frac{2\pi mX}{L} + b_{jm} \sin \frac{2\pi mX}{L} \right) \quad (10)$$

Where A is the amplitude, B is the base (e or 10), and α is the attenuation constant for the Natural, or amplification constant for the Sorted Variation. In the Fourier summation we will have $L=114$, which equals the number of chapters in Quran. Here, $J=2j$, and indicates the number of Fourier terms used in this mathematical modeling.

To compute parameters of this equation for the intended variation, regression analysis or least-squares fitting of the above function to the observed variation should be performed. However, in order to avoid complexities of the nonlinear regression, the logarithmic form of both equations (10) and the logarithmic variation in Quran will be used for the regression analysis, in other words the equation,

$$\log_{BY_J}(X) = \log_B A_J + n / \alpha_J + \sum_{m=1}^j \left(a_{jm} \cos \frac{2\pi mX}{L} + b_{jm} \sin \frac{2\pi mX}{L} \right) \quad (11)$$

will be least squares fitted to the logarithm of the observed Variation (linear regression). Equation (11) will be used consistently, to model the Principle Variations in Quran. For the Natural Variations the variable x will be replaced by "i" the chapter order, and for the Sorted Variations x will be replaced by "n", the sort order. In cases where odd number of Fourier waves will be used, $J=2j+1$, and it will mean that the sine or the cosine term (not both) of the $j+1$ Fourier summation will also be added to the regression equation. We define A_J and α_J , as the main parameters of the SF-analysis with $J=0$, corresponding to a straight line regression (with no Fourier terms present). Note that in this process of linear regression initially two other parameters,

$$K_J \equiv \log_B A_J \quad (12)$$

$$\text{and } \beta_J \equiv \alpha_J^{-1} \quad (13)$$

are computed, whereby A_J and α_J can be obtained. All computed parameters shall be termed as **F-parameters**. It should also be noted that A_J is a base-independent F-parameter (for a given Variation, A computes the same for all B values).

The software used for the analyses was "Minitab-16" (IBM-SPSS was seen to produce identical results). The regression analysis was naturally terminated (shown by NT in Table 4) when the number of predictor functions exceeded the number of data points in the response. Obviously the maximum number of data points could never exceed 114, which is the number of chapters in Quran. In several occasions Minitab decided to remove the x-term (the linear term) from the regression equation due to it being "Highly Correlated with other predictor variables" (shown by HC in Table 4) and this marked an ending point to the computation for that particular Variation simply because alpha was no longer present to be computed. Table 4 also shows some information and statistics concerning SF-analysis of the 31 Sorted, and 31 Natural Variations in Quran.

In Table 4 we can see the number of data points for each character. For instance, there are only 97 chapters in Quran which have "zin" in them (17 remaining chapters have zero zins in them). R-squared values of the regression analysis have also been given for $J=0$, 2, and for the terminal points. Computed adjusted R-squares have also been given for the terminal points. The Pearson correlation product moments have also been computed between the SVs and NVs of all characters, and SV and NV of the words, respectively. Jt (J-terminal) shows the J value of the last computed regression and the cause of this termination (NT or HC).

Table 4.

| In | In | No of data | Jt | SV corr | $R^2(J=0)$ | $R^2(J=2)$ | R^2 | R^2_{adj} | Jt | NV corr | $R^2(J=0)$ | $R^2(J=2)$ | R^2 | $R^2_{(adj)}$ |
|---------|--------|------------|---------|------------------|------------|------------|--------|-------------|--------|------------------|------------|------------|--------|---------------|
| English | Arabic | points | for SVs | with SV of words | for SV | for SV | at Jt | at Jt | for | with NV of words | for NV | for NV | at Jt | at Jt |
| | | | | | | | for SV | for SV | NVs | | | | for NV | for NV |
| alif | الف | 114 | 112 NT | 0.9993 | 97.4 | 99.4 | 100 | 100 | 112 NT | 0.9984 | 84.1 | 86.7 | 100 | 98.9 |
| beh | ب | 114 | 112 NT | 0.9985 | 97.1 | 99.2 | 100 | 100 | 112 NT | 0.9924 | 81 | 83.2 | 99.9 | 99.6 |
| teh | ت | 113 | 110NT | 0.9949 | 94.9 | 99.0 | 100 | 100 | 110NT | 0.9927 | 78 | 81 | 100 | 97.9 |
| thet | ث | 98 | 68 HC | 0.9952 | 97.3 | 98.5 | 99.9 | 99.8 | 86 HC | 0.9684 | 70.4 | 71.6 | 97.8 | 79 |
| jim | ج | 106 | 96 HC | 0.9848 | 95.4 | 99.2 | 100 | 99.9 | 102NT | 0.9681 | 85.7 | 87.8 | 100 | 98.8 |
| ha | ح | 114 | 112 NT | 0.9986 | 99 | 99.1 | 100 | 99.9 | 112NT | 0.9917 | 82.9 | 83.3 | 99.9 | 94.5 |
| kha | خ | 105 | 92 HC | 0.9949 | 97.7 | 99.1 | 100 | 100 | 104NT | 0.9805 | 86.9 | 87.1 | 99.7 | 65.7 |
| dal | د | 111 | 108 NT | 0.9982 | 97.3 | 98.9 | 100 | 100 | 108 NT | 0.9858 | 76.1 | 76.8 | 99.8 | 76.2 |

| | | | | | | | | | | | | | | |
|---------|-------|-----|--------|--------|------|------|------|------|--------|--------|------|------|------|------|
| dhal | ذ | 109 | 106 NT | 0.9962 | 94.6 | 98.5 | 100 | 100 | 106 NT | 0.9789 | 71.3 | 74.1 | 100 | 98.2 |
| ra | ر | 114 | 112 NT | 0.9978 | 97.3 | 99.4 | 100 | 100 | 112 NT | 0.9911 | 82.9 | 85.3 | 100 | 100 |
| zin | ز | 97 | 66 HC | 0.9901 | 97.8 | 98.9 | 99.9 | 99.8 | 76 HC | 0.9568 | 84.7 | 85.4 | 96.5 | 82.4 |
| sin | س | 114 | 112NT | 0.9967 | 96.3 | 99.2 | 100 | 100 | 112 NT | 0.9901 | 79.9 | 81.8 | 99.9 | 95.6 |
| shin | ش | 100 | 74 HC | 0.9898 | 97.5 | 98.7 | 100 | 99.9 | 94 HC | 0.9607 | 77.7 | 77.8 | 99.2 | 83.9 |
| sad | ص | 107 | 100 HC | 0.9918 | 97.6 | 98.9 | 100 | 99.9 | 104 NT | 0.9766 | 76.9 | 77.2 | 100 | 96.3 |
| dad | ض | 97 | 66 HC | 0.9924 | 97.7 | 98.4 | 99.9 | 99.8 | 80 HC | 0.9775 | 75.4 | 76 | 97 | 80.6 |
| ta | ط | 102 | 80 HC | 0.9967 | 98.1 | 98.8 | 100 | 99.8 | 96 HC | 0.9658 | 72.4 | 72.5 | 99.9 | 98.2 |
| dha | ظ | 86 | 44 HC | 0.9924 | 97.7 | 98.3 | 99.9 | 99.7 | 48 HC | 0.9551 | 70.9 | 71.3 | 88.3 | 72.5 |
| ain | ع | 112 | 110 NT | 0.9970 | 96.7 | 98.9 | 100 | 100 | 110 NT | 0.9952 | 82.8 | 84.8 | 99.9 | 97.2 |
| ghain | غ | 99 | 70 HC | 0.9834 | 97.2 | 98.1 | 99.9 | 99.8 | 92 HC | 0.9617 | 71.8 | 72.1 | 98 | 72.6 |
| feh | ف | 113 | 110 NT | 0.9950 | 94.4 | 98.9 | 100 | 100 | 110 NT | 0.9908 | 87.9 | 91.5 | 100 | 96.5 |
| qaf | ق | 109 | 106 NT | 0.9978 | 95.4 | 99.1 | 100 | 100 | 106 NT | 0.9843 | 76.3 | 79.6 | 100 | 99.7 |
| kaf | ك | 111 | 108 NT | 0.9972 | 95.9 | 99.4 | 100 | 100 | 108 NT | 0.9939 | 80.5 | 83.5 | 100 | 99.9 |
| lam | ل | 114 | 112 NT | 0.9977 | 98.3 | 99.2 | 100 | 100 | 112 NT | 0.9957 | 93.7 | 94.7 | 99.9 | 95.7 |
| mim | م | 114 | 112 NT | 0.9978 | 97.4 | 99.2 | 100 | 100 | 112 NT | 0.9960 | 85.2 | 87.8 | 100 | 99.1 |
| nun | ن | 114 | 112 NT | 0.9979 | 96.9 | 99.5 | 100 | 100 | 112 NT | 0.9935 | 83.6 | 86.9 | 99.9 | 94 |
| heh | ه | 114 | 112 NT | 0.9981 | 96.2 | 99.1 | 100 | 100 | 112 NT | 0.9904 | 80.3 | 83.3 | 100 | 98.5 |
| waw | و | 114 | 112 NT | 0.9975 | 95.9 | 99.5 | 100 | 100 | 112 NT | 0.9944 | 80.1 | 84.2 | 100 | 99.1 |
| yeh | ي | 114 | 112 NT | 0.9982 | 95.9 | 99.3 | 100 | 100 | 112 NT | 0.9970 | 82.7 | 85.8 | 100 | 99.8 |
| letters | حروف | 114 | 112 NT | 0.9997 | 97.7 | 99.4 | 100 | 100 | 112 NT | 0.9996 | 84.9 | 87.5 | 100 | 99.9 |
| words | كلمات | 114 | 112 NT | 1.0000 | 97.8 | 99.4 | 100 | 100 | 112 NT | 1.0000 | 84.6 | 86.9 | 100 | 100 |
| verses | آيات | 114 | 112 NT | 0.9769 | 97.9 | 99.7 | 100 | 100 | 112 NT | 0.8787 | 69.7 | 71.6 | 100 | 98.9 |

Some statistics and computed results of the SF-analysis of 31 Sorted, and 31 Natural Variations in Quran.

9. Observation of the NBF Structure

9.1 Definitions

Multiples of nineteen can easily be detected among integers but for a given set of real numbers "a multiple of 19" must be strictly defined. Any real number can be written in the following decimal notations:

$d_1d_2.d_3d_4d_5d_6d_7d_8... \times E(k)$ or equally as $d_1d_2d_3.d_4d_5d_6d_7d_8... \times E(k-1)$, etc., where d_i is the i -th digit and can be an integer between 0 and 9 (d_1 cannot be 0) and where k can be 0, or any positive or negative integer. We briefly call the first notation as "2-d", and the second notation as "3-d" representations of a real number (this definition can obviously be extended to any number of digits). For instance, π can be written in the following forms: $\pi = 3.1415926... \times E0$, or $31.415926... \times E-1$ (2-d representation), or as $314.15926... \times E-2$ (3-d representation), etc.

■ Definition: A real number is defined in this article to be a Multiple of Nineteen or MN($19 \times n$) with n being a positive or negative integer, if the value of its 2-d or 3-d representation, not considering its exponent, lies in the range $(19 \times n) \pm \Delta$.

The limiting range Δ defines an interval which is arbitrary but of course its value determines the occurrence probabilities of the MNs. *In this article, unless otherwise stated, Δ is taken equal to 2*, so a real number would be a MN($19 \times n$) if the absolute value of its 2-d or 3-d representation lies between $(19 \times n) - 2$ and $(19 \times n) + 2$. See the following examples of MNs:

2-d MNs are: 19, 38, 57, 76, 95 (a total of 5 integers) with the following examples:

$-37.53269... \equiv -MN(38)$, (because $37.532... \equiv 38$ lies within ± 2 of 38),

$55939870452.546... \equiv MN(57)E9$, ($= 55.939... \times E9$ lies within ± 2 of 57),

$0.000074501... \equiv MN(76)E-6$, ($= 74.501... \times E-6$ lies within ± 2 of 76)

3-d MNs are: 114, 133, 152, 171, 190, 209, 228, 247, 266, 285...969, 988, (a total of 47 integers) with the following examples:

$0.00013467... \equiv MN(133)E-6$, ($= 134.67... \times E-6$, lies within ± 2 of 133),

$1126743.4352... \equiv MN(114)E4$, ($= 112.674352... \times E4$, lies within ± 2 of 114),

-229.45730... \equiv MN(228), (229.457... lies within ± 2 of 228)

Examples of simultaneous 2-d and 3-ds MNs are:

-188.3 \equiv MN(-19)E1 \equiv -MN(190),

207106543.4563 \equiv MN(19) E7 \equiv MN(209)E6,

0.00378932... \equiv MN(38)E-4 \equiv MN(380)E-5

■ Definition: The Nineteen Based Fourier Structure (NBFS) and its effects in Quran is inferred to the numerous, mainly 2-d and 3-d, MN values of the F-parameters which are computed and observed through the SF-analysis of its Principle Variations. These are manifested both, as absolutely unique effects particular to the individual Variation and also, as some general characteristics.

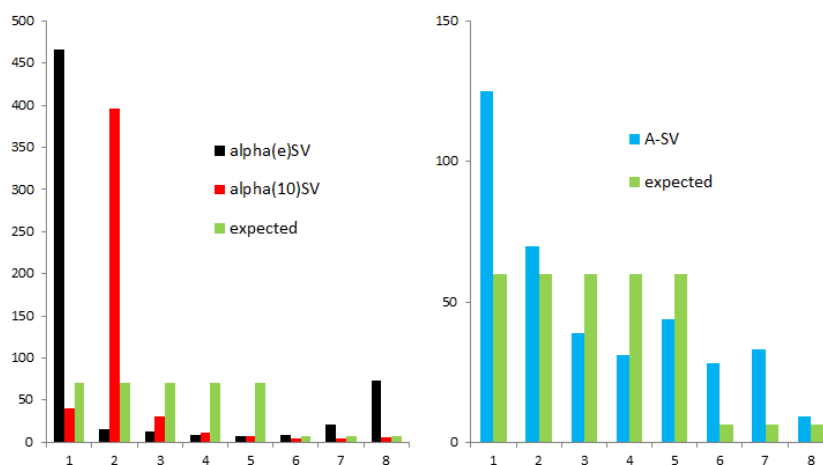
In a number of following tests of structural sensitivity it will clearly be seen that not only the exactness of the observed effects but their high susceptibility to minimal manipulations in quantitative construct of Quran is what makes the NBFS such a phenomenal construct.

9.2 General NBFS Statistical Observations

There are 90, 2-digit integers and only 5 of them are multiples of 19 so, with $\Delta=2$ as taken in the above, the total probability that any given real number be a 2-digit MN is $4 \times 5/90 = 2/9$. So the probability that a given real number be a *specific 2-digit MN* is $2/45$. There are also 900, 3-digit integers with 47 of them being multiples of 19 so the total probability that a real number be a 3-digit MN is $4 \times 47/900$ and therefore the probability for a given real number to be a *specific 3-digit MN* would be $4/900$ which is exactly one tenth its probability for being a specific 2-digit MN. For example, the probability for a randomly chosen real number to be a 2-d MN(57) is $2/45$ whereas its probability for being a 3-d MN(152=19 \times 8) is $2/450$, etc. In general, the total probability for a real number to be a m-digit MN number is $2/9$ and for it to be a specific m-digit MN is $(2/45) \times E(2-m)$.

In this article we are not going to enter an in-depth statistical and probabilistic discussion of the observed effects, neither are we for instance going to complicate the situation by defining a variable, case-dependent Δ which in fact is needed in order to study the precision tuning of the individual effects. However, we shall present here some statistically abnormal characteristics of the computed F-parameters which cannot be expected of a *random distribution of real numbers*. It should be noted that computed F-parameters for J=19, 57, and 95, have been omitted from these statistical evaluations (since these are odd values of J and were not completely nonselective in the sense that we chose either sine or cosine terms for computing in regression equations).

Figure 18 shows the frequency distributions of the combined MNs computed for 31 Sorted Variations and for each specific F-parameter. Horizontal axis represents multiples of 19 (1 for 19, 2 for 38, 3 for 57, etc.), with vertical axis representing the observed frequencies. The total number of parameters for each specific F-parameter was 1,582 except for A (1,345 for A-SVs). The expected values are computed by multiplying the total number of cases by the probability $(2/45)$ for the 2-d MNs, and by the probability $(2/450)$ for the 3-d MNs (for the 2-ds, for instance, $1582 \times (2/45) = 70.3$, as shown by five green verticals in alpha, beta, and K plots).



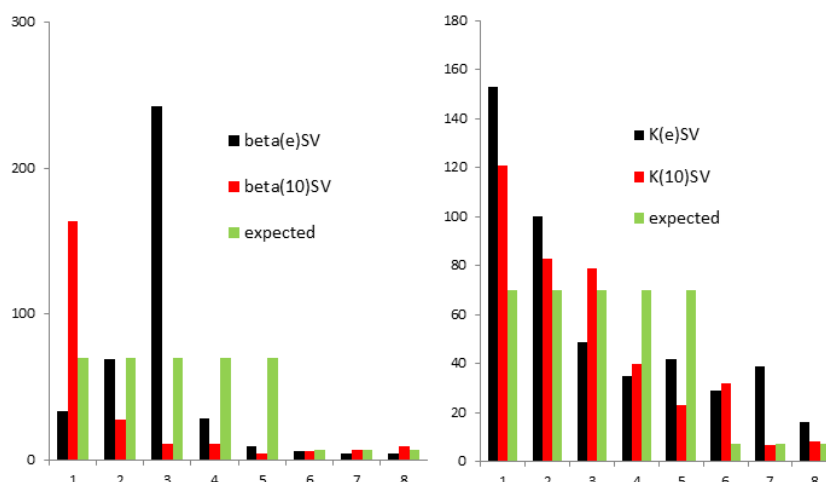
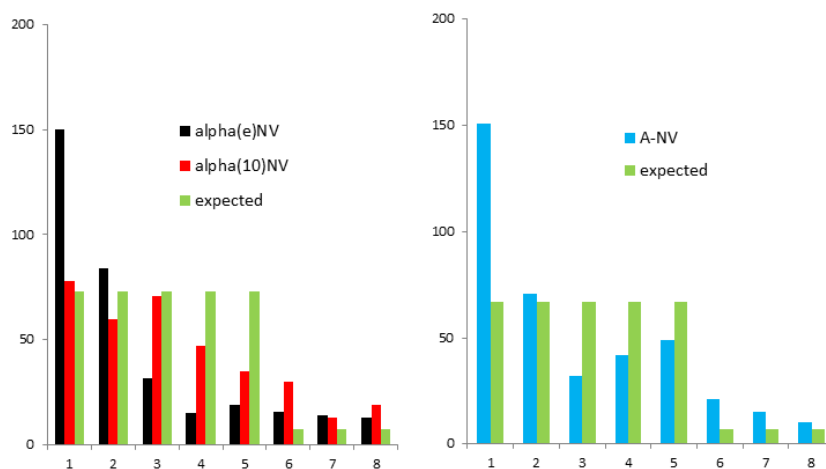


Figure 18. Frequency distributions of the specified F-parameters computed for the SVs
Combined results of the computed F-parameters for the 31 Sorted Variations in Quran.

Notice from Figure 18, that irrespective of the total expected probability of $2/9$ that an F-parameter be a 2-d MN or a 3-d MN, equal probabilities which are expected to be observed within same digit MNs is clearly violated such that for instance for $\alpha(e)s$ the frequency of MN(19)s is almost 30 times frequency of MN(38)s. The situation is almost reversed when the computation base is changed from e to 10 , so that now the frequency of those $\alpha(10)s$ which are MN(38)s is 10 times frequency of MN(19)s. Plots of other F-parameters also show strongly base-dependent non-equal relative frequency distributions.

A somewhat similar but not with the same intensities of occurrence can be observed for the frequency distributions of the F-parameters computed for the Natural Variations of Quran in Figure 19, where here, the total number of computed F-parameters are 1,638 for the NVs (1,501 for A-NVs).



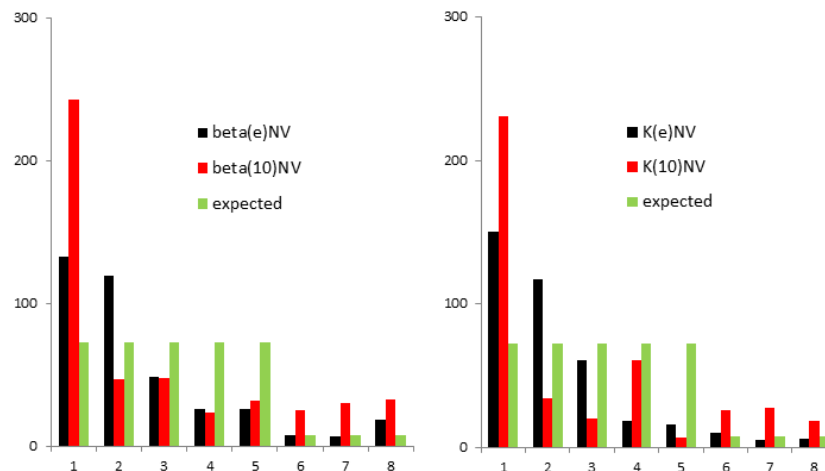


Figure 19. Frequency distributions of the specified F-parameters computed for the NVs
Combined results of the computed F-parameters for the 31 Natural Variations in Quran.

9.3 Classification of the Observed NBFS Manifestations and Effects

The NBFS effects observed in Quran, lend themselves for observation in a variety of ways as we will soon see, but they can mainly be classified as in the following:

The F-parameter computes as a MN at J values that are multiples of 19 and such coincidences will be called a "coupling".

The F-parameter computes as a MN at J=0 (with no Fourier terms), at J=2 (with introduction of the first two Fourier terms), or at terminal J values.

The F-parameter for many continuous values of J computes as a constant MN to be called CV, and sometimes it strictly obeys a Lower Bound MN value (LB), or an Upper Bound MN value (UB).

For many of maximum or minimum points in the graphs, either the value of F-parameter or J or both are MN. In many cases these points of extrema are points of absolute minimum or absolute maximum.

For some Sorted Variations, the value of J-alpha(J), changes sign from a continuous negative to a continuous positive, indicative of *coincidence of the value of J with the value of alpha* at the point of sign change, and this will be called a "Fundamental Coupling" at that J. J happens to be 19 for some major letters and characters.

Base-independent F-parameter A, and base-dependent F-parameters "K", "beta", and "alpha" in two popular bases e and 10, have been computed for 31 SVs and 31 NVs in Quran.

■ Definition: The plot of a computed F-parameter vs. J will be called the "**F-plot**" of that F-parameter.

Although all F-parameters show NBF regulations, but for brevity, only A and alpha results are tabulated in Tables 5-6 for their observed NBFS couplings and effects. However, to show the NBFS effects of K and beta, many of their F-plots will also be shown in this article. These F-plots will immediately follow Tables 5-6. It has been tried to show as many of the F-plots as possible, but for those which are not shown, the Tables should provide sufficient information. Usually, because the effects show themselves in a wide range of orders of magnitude, it was not possible to show all effects in one F-plot.

9.4 Notations Used in the Tables and Figure Captions of the F-Plots

(J, Y): is the Cartesian coordinate of the F-parameter in the F-plot which means at J, the F-parameter has the value Y. (J, Y) would represent a Coupling, if J is a multiple of 19 and Y is also a MN.

CV: Constant Value is established e.g. CV(4-26, 38) would mean F-parameter stays constant at MN(38), from J=4 to J=26.

UB: Upper Bound is established, e.g. UB(4-40,38) would mean F-parameter is kept just bellow MN(38), from J=4 to J=40.

LB: Lower Bound is established, e.g. LB(10-92, 0.57) would mean F-parameter is kept just above MN(0.57), from J=10 to J=92.

M: a maximum, e.g. M(24, 13.3) would mean the F-parameter shows a local maximum at J=24 with a value MN(133)E-1.

AM: Absolute maximum, e.g. AM(32,26.6) would mean the F-parameter shows its greatest value at J=24 with a value MN(266)E-1.

m: a minimum, (similar to M).

Am: Absolute minimum and has similar definition as AM, except for being the smallest value.

FC(19): Fundamental Coupling at 19 or (19, 19).

ext: (exact), means $\Delta=0.5$, which means MN value is within $(19 \times n) \pm 0.5$, e.g., 76.17, or 75.7, are both ext MN(76).

2-d/3-d: A simultaneous 2-d and 3-d MN.

In many cases in the following Tables and in Figure captions we use the decimal notation instead of the Exp notation, for instance MN(3.8) is equivalent to MN(38)E-1, or -MN(0.152) is the same as -MN(152)E-3, etc.

Examples of the F-parameter notations:

A-SV: A computed for the Sorted Variation,

alpha(e)SV: alpha computed in base e for the Sorted Variation,

beta(e)NV: beta computed in base e for the Natural Variation,

alpha(10)NV: alpha computed in base 10 for the Natural Variation, etc.

9.5 The List of 2-d and 3-d Multiples of 19

Multiples of 19 are presented here for quick referencing:

The five 2-d multiples of 19 are: 19, 38, 57, 76, 95

The forty seven 3-d multiples of 19 are: 114, 133, 152, 171, 190, 209, 228, 247, 266, 285, 304, 323, 342, 361, 380, 399, 418, 437, 456, 475, 494, 513, 532, 551, 570, 589, 608, 627, 646, 665, 684, 703, 722, 741, 760, 779, 798, 817, 836, 855, 874, 893, 912, 931, 950, 969, 988

Table 5.

| Character | J=0 | J=2 | J=19 | J=38 | J=57 | J=76 | J=95 | J-terminal, value | Major additional observations |
|--------------|---------------|------------|-------------|------------|------------|------------|--------------|-------------------|---|
| A-SV-verses | AM 57 E-1 | | 38 E-1 | 38 E-1 | 38 E-1 | 38 E-1 | 38 E-1 | | CV(12-82, 38E-1) |
| A-SV-words | AM 228 E-1 | 19 | 133 E-1 | | | | | J=112, 57 E-1 | CV(19-30, 133E-1), CV(84-104, 95E-1), Am(112,57E-1) |
| A-SV-letters | AM~95 | 76 | 57 | | | 494 E-1 | M 57 E-1 | J=112, Am 38 | |
| A-SV-الف | 19 | 133 E-1 | | | 76 E-1 | | 703 E-2 | J=112, 494 E-2 | CV(46-62,76E-1) |
| A-SV-ب | 323 E-2 | | | | 95 E-2 | 95 E-2 | 95 E-2 | | CV(50-96,95E-2) |
| A-SV-ت | | 19 E-1 | 95 E-2 | | | | | | M(38,1.29) , m(68,38E-2) , m(95, 8.6) , m(102,19) |
| A-SV-ث | | 266 E-3 | 703 E-9 | | | | | | M(18,133E-4) |
| A-SV-ج | | 57 E-2 | | | | | | | m(38,154E-7) , AM(58,38E13) |
| A-SV-ح | AM 228 E-2 | 19 E-1 | | 133 E-2 | 133 E-2 | | | | CV(38-66,133E-2) , CV(80-92, 114E-2) |
| A-SV-خ | | 456E -3 | 19 E-2 | | | | | | Sharp M(38, 2.78) |
| A-SV-د | 19 E-1 | | M 95 E-2 | | 228 E-3 | | M 76 E-10 | | m(54, 152E-3) |
| A-SV-ذ | | | | | | | | | M(38, 0.155) |

| | | | | | | | |
|------------------------|----------------|--------------|-------------|------------|-------------|----------------------|--|
| A-SV-ر | 38 E-1 | | 19 E-1 | 19 E-1 | 19 E-1 | 19 E-1 | CV(38-92, 19E-1) |
| A-SV-ز | 38 E-2 | 76 E-9 | | | | | |
| A-SV-س | | | | | | | CV(42-50, 114E-2) , m(12, 95E-2) |
| A-SV-ش | 76 E-2 | | | | | | Sharp M(19, 28,000) |
| A-SV-ص | 57 E-2 | 19 E-2 | | | | | m(22, 95E-3) |
| A-SV-ض | | 76 E-13 | | | | | Sharp M(58, 57E4) , m(4,19E-2/171E-3) |
| A-SV-ط | 532 E-3 E-2 | 38 | | | | | |
| A-SV-ظ | | 38 E9 | | | | | Sharp M(10, 152E-1) |
| A-SV-ع | 152 E-2 | 95 E-2 | M 76 E-2 | 152 E-3 | | | M(18-19-20, 95E-2) |
| A-SV-غ | | 266 E-3 | | | | | M(10, 228E-3) , M(6, 437E-3) |
| A-SV-ف | | 114 E-2 | 76 E-2 | | | | M(19,114E-2), m(40,76E-2), m(70, 57E-2), m(95, 0.137) |
| A-SV-ق | | M 114 E-2 | 494 E-4 | 57 E-19 | 19 E-247 | | Very sharp and exact M(62, 79135=4165X19) |
| A-SV-ك | 228 E-2 | M 76 E-2 | 57 E-2 | 19 E-1 | | J=96, 19E-10 | m(38, 57E-2) |
| A-SV-ل | 95 E-1 | M 76 E-1 | 608 E-2 | 57 E-1 | 494 E-2 | | CV(42-68, 57E-1) , Am(106, 38E-1) |
| A-SV-م | 57 E-1 | 38 E-1 | | 285 E-2 | | | CV(8-24, 38E-1) |
| A-SV-ن | AM 57 E-1 | | 228 E-2 | 266 E-2 | | | CV(38-46, 228E-2), including m(40, 228E-2) |
| A-SV-هـ | | | | 133 E-2 | J=112,19E-1 | | Terminal point M(112, 19E-1) |
| A-SV-و | 513 E-2 | | 19 E-1 | 19 E-1 | 19 E-1 | | m(76, 171E-2), M(92,19E-1) |
| A-SV-ى | 418 E-2 | | | | 19 E-1 | | CV(80-98, 19E-1) |
| alpha(e)SV- verses | 285 E-1 | | | | 247 E-1 | J=112, Am 228 E-1 | UB(8-68, 266E-1) |
| alpha(e)SV- words | AM 228 E-1 | 19 | 19 | 19 | 19 | 19 | CV(2-96, 19) FC(19,19) |
| alpha(e)SV- letters | AM 228 E-1 | 19 | 19 | 19 | 19 | 19 | CV(2-110, 19) FC(19,19) |
| alpha(e)SV- الف | AM 228 E-1 | 19 | 19 | 19 | | J=112, Am152 E-1 | FC(19,19) |
| alpha(e)SV-ب | 19 | 19 | | 15 E-1 | 152 E-1 | 152 E-1 | CV(42-110, 152E-1) |
| alpha(e)SV-ت | 19 | 152 E-1 | | 133 E-1 | | | M(95, 50.4), M(38, 16.4) |
| alpha(e)SV-ث | 19 | 95 E-1 | 57 E-3 | 38 E-5 | | | M(4, 19), m(38, 57E-4), M(40, 152E-3) |
| alpha(e)SV-ج | 228 E-1 | 19 | 152 E-1 | 19 E-1 | 152 E-4 | | Am(44, -285E-1), m(38, 4.46), CV(2-14, 19) |
| alpha(e)SV-ح | | | | | 19 | 19 | J=112, 19 |
| alpha(e)SV-خ | 19 | 152 E-1 | 38 | | | J=102, 532E-2 | AM(38, 38/399E-1), m(4,19), M(24, 19), m(32, 57E-1) |
| alpha(e)SV-د | 19 | 19 | 152 E-1 | | 665 E-2 | | M(19, 19), CV(2-30, 19), M(68, -19) |
| alpha(e)SV-ذ | 19 | 19 | | m 285 | 456 | | CV(2-24, 19), very sharp Am(50, -19X19=-361), m(38,12.2) |

| | | | | E-2 | | E-5 | |
|---------------------|---------|------|--------|------|-------|-----------------|--|
| alpha(e)SV-ر | AM | 19 | 19 | 19 | 19 | 19 | CV(50-100, 171E-1) Fundamental Coupling |
| | 247E-1 | | | | | | |
| alpha(e)SV-ز | | | | 114 | | J=68, 209E-7 | m(19, 2.8), sharp m(38, -0.45) |
| | | | | E-6 | | | |
| alpha(e)SV-س | | 19 | 19 | 19 | 19 | 19 | J=112, 19 CV(2-112, 19), LB(70-90, 171E-1) |
| alpha(e)SV-ش | | | | 817 | | J=74, 475E-8 | M(12, 133E-1), M(19, 26.2), m(20, -152E-1) |
| | | | | E-6 | | | |
| alpha(e)SV-ص | | 152 | | 114 | 57 | | m(6, 19), M(14, 228E-1), M(54, 19) |
| | | E-1 | | E-2 | E-3 | | |
| alpha(e)SV-ض | | 19 | | -209 | | | MCV(6-10, 19), M(26, 19E-1) |
| | | | | E-6 | | | |
| alpha(e)SV-ط | | 228 | | -874 | | J=80, 19E-6 | M(6, 228E-1), m(16, 133E-1), sharp Am(42, -57) |
| | | E-1 | | E-4 | | | |
| alpha(e)SV-ظ | AM | 19 | 19 E-2 | | | | CV(2-6, 19), M(19, 19E-2) |
| | 228E-1 | | | | | | |
| alpha(e)SV-ع | | 19 | | | | | m(66, 95E-1), m(90, -57), sharp fluctuations from J=76-95 |
| alpha(e)SV-غ | | | M 19 | -247 | | | m(10,19)m(22,3.8)M(24,19)M(40,114E-1)AM-Am=19X18 |
| | | | | E-5 | | | |
| alpha(e)SV-ف | | 19 | 19 | | | | CV(12-24,171E-1), m(38,15.4) |
| alpha(e)SV-ق | AM 19 | 19 | M 19 | 19 | M114 | | M(40, 19),M(57, 114E-1)M(62,-76E-1)m(64,-532E-1)M(66,38E-1),M(72,19E-1), M(78,19E-1) |
| | | | | | E-1 | | |
| alpha(e)SV-ك | 19 | 19 | 152 | 19 | | m133 | m(38, 14.2), M(90, 76E-1), AM(50-52, 228E-1) |
| | | | E-1 | | | E-2 | |
| alpha(e)SV-ل | AM 228 | | 19 | 19 | 19 | 19 | CV(82-100, 171E-1) |
| | E-1 | | | | | | |
| alpha(e)SV-م | | 19 | 19 | | | | m(76, 15.8) |
| alpha(e)SV-ن | AM 19 | 19 | | | | Am(112,152 E-1) | UB171E-1, LB152E-1 |
| alpha(e)SV-هـ | AM19 | 19 | | | | J=112, 19 | |
| alpha(e)SV-و | AM19 | 19 | | 152 | | 152 | CV(56-98, 152E-1), M(92,152E-1) |
| | | | | E-1 | | E-1 | |
| alpha(e)SV-ي | | 19 | 19 | | 152 | | M(16, 171E-1), CV(74-90, 152E-1) |
| | | | | | E-1 | | |
| alpha(10)SV-verses | | | | | 57 | 57 | UB(8-68, 608E-1) |
| alpha(10)SV-words | | 475 | | 418 | 38 | 38 | CV/LB(66-110, 38) |
| | | E-1 | | E-1 | | | |
| alpha(10)SV-letters | | 475 | | | | J=112, Am38 | M(95,43.1) |
| | | E-1 | | | | | |
| alpha(10)SV-الف | | | 38 | 38 | 38 | 38 | (LB) CV(50-100, 38) |
| alpha(10)SV-ب | AM 513 | | 38 | | | | CV(54-98, 342E-1) |
| | E-1 | | | | | | |
| alpha(10)SV-ت | | 342 | 38 | 323 | | | m(16, 342E-1), M(38,38), AM(100, 247) |
| | | E-1 | | E-1 | | | |
| alpha(10)SV-ث | AM 57 | | | | | | Am(30, -76) |
| alpha(10)SV-ج | | 437 | 38 | 418 | 38 E6 | J=104, -19E-6 | AM(30, 361E+1) (361=19X19) m(38, 10.3) |
| | | E-1 | | E-2 | | | |
| alpha(10)SV-ح | | m513 | 494 | 494 | | | CV(28-64, 494E-1) |
| | | E-1 | E-1 | E-1 | | | |
| alpha(10)SV- | 513 E-1 | | | | | -95 E-5 | AM(38,92.2), Am(50, -152E-1), m(62,-57E-1) |

| | | | | | | | | | |
|--------------|---------|-----|--------|--------|--------|--------------|-----------|---|--|
| خ | | | | | | | | | |
| alpha(10)SV- | | | | 152 | 57 E-1 | J=108, 38E-3 | | m(10,38), m(46, 285E-1), M(68, -475E-1), M(92, 95E-1) | |
| د | | | | E-1 | | | | | |
| alpha(10)SV- | 532 E-1 | 437 | | | -228 | | | m(6, 38), m(38, 28), AM(46,19E+1), M(64, 171), M(50, 38), | |
| ذ | | E-1 | | | E-2 | | | M(57, 6.5) | |
| alpha(10)SV- | AM 57 | 437 | | 38 | 38 | 38 | J=112, 38 | CV(50-112, 38) | |
| ر | | E-1 | | | | | | | |
| alpha(10)SV- | | 646 | | 266 E6 | | | | M(8-12, 513E-1), m(19, 646E-2), sharp m(38, -0.103) | |
| ز | | E-2 | | | | | | | |
| alpha(10)SV- | | 418 | | 38 | | | | CV(16-22, 418E-1), M(42,437E-1), CV(64-90, 399E-1) | |
| س | | E-1 | | | | | | | |
| alpha(10)SV- | 57 | -19 | -494 | 19 E-4 | | | | m(10-12, 304E-1), Am(18, -19E+1), M(19, -19), M(22, 38), m(26, 38E-1) | |
| ش | | | E-3 | | | | | | |
| alpha(10)SV- | 57 | | | | | J=100, | | m(42, 152E-1), M(46, 19E+1), m(58, 228E-2) | |
| ص | | | | | | -19E-5 | | | |
| alpha(10)SV- | | 152 | | | | J=66, -95E-1 | | m(4, 38), m(18, 57E-1), Am(22, -19) | |
| ض | | E-1 | | | | | | | |
| alpha(10)SV- | 57 | m38 | 38 E-1 | -19 | | | | m(16,304E-1), M(30, 95E-1), m(46, -152E-2) | |
| ط | | | | E-3 | | | | | |
| alpha(10)SV- | | | | | | | | m(19, -8.44), M(20, 38E-2) | |
| ظ | | | | | | | | | |
| alpha(10)SV- | 494 E-1 | 437 | 38 | 247 | 38 | 19 | | CV(6-32, 38), AM(82, 19E+1), M(92, 494E-1) | |
| ع | | E-1 | | E-1 | | | | | |
| alpha(10)SV- | 57 | | | -57 | | J=70, 38E-6 | | Am(16, -551= -19X29) | |
| غ | | | | E-4 | | | | | |
| alpha(10)SV- | | 38 | | 38 | 38 | | | CV(4-62, 38), M(8, 38), M(16, 399E-1) | |
| ف | | | | | | | | | |
| alpha(10)SV- | | 38 | 38 | | 323 | J=106, | | CV(4-12, 38), M(62, -19) | |
| ق | | | | | E-2 | 114E-6 | | | |
| alpha(10)SV- | | | 437 | 76 | | | | AM(52,532E-1)Am(98,-152E-2)M(28,38)m(38,32.7)M(90,19)m(| |
| ك | | | E-1 | E-1 | | | | 94,418E-2)M(96,57E-1) | |
| alpha(10)SV- | AM 532 | | 418 | 38 | 38 | J=112, 38 | | Am(106,38), m(76,399E-1) | |
| ل | E-1 | | E-1 | | | | | | |
| alpha(10)SV- | AM 513 | | 38 | 38 | 38 | 38 | | CV(28-68, 38) | |
| م | E-1 | | | | | | | | |
| alpha(10)SV- | AM 475 | 38 | 38 | 38 | 38 | 38 | | CV(8-108, 38) m(40, 361E-1) | |
| ن | E-1 | | | | | | | | |
| alpha(10)SV- | | 38 | 342 | | 38 | 38 | | M(22,38), m(42,342E-1), m(110,38), CV(6-28, 38) | |
| هـ | | | E-1 | | | | | | |
| alpha(10)SV- | AM 475 | 418 | 38 | 38 | | | | CV(10-26,38), m(76,33.9) | |
| و | E-1 | E-1 | | | | | | | |
| alpha(10)SV- | | 38 | 38 | 38 | | 342 | | M(12, 38), CV(8-62,38) | |
| ى | | | | | | E-1 | | | |

NBFS Couplings and effects observed for the F-parameters A and alpha, as computed for the Sorted Variations of the specified characters in Quran.

Table 6.

| Character | J=0 | J=2 | J=19 | J=38 | J=57 | J=76 | J=95 | J-terminal, value | Major additional observations |
|---------------|------------|-------------|------|----------|------|------|------|-------------------|-------------------------------|
| A-NV-verse s | | AM 19X10ext | M 57 | M 228E-1 | | | | | m(50, 114E-1), M(76, 8.88) |
| A-NV-word s | 304E1 | | | M 19E+1 | | | 19 | J=112, 893E-2 | M(56, 50.1), M(104, 19E+1) |
| A-NV-letter s | 19X68 5ext | | | M 893 | | | | | M(76, 236), AM(2, ~133EE+2) |

| | | | | | | | | |
|------------------------|---------------|---------|---------------|-----------------|-------------|------------------|-------------------|---|
| A-NV-الف | | | M 133 | | M 38 | | J=112, 874E-1 | |
| A-NV-ب | | | | | | 95E-1 | J=112,Am76 E-2 | M(19, 129.4) |
| A-NV-ت | AM | 19E+1 | | 114E-1 | | | | CV(18-22, 19E+1), M(76,8.13) |
| A-NV-ث | | 57E+1 | | | | | | Sharp M(36, 361E+2) |
| A-NV-ج | | 19E+1 | 19E+1 | | | | | m(57, 9.7), M(38, 311), m(30, 171ext), M(26, 228ext), m(14,19E+1), M(2,19E+1) |
| A-NV-ح | 133 | | | | M 95E-1 | 38E-1 | | M(10, 95), M(40,266E-1), M(104, 76E-1) |
| A-NV-خ | | | 133 | M 228 | | | | m(14, 114) M(22,171),m(32,114),M(46, 266), m(66, 76) |
| A-NV-د | AM | 19E+1 | 76 | 19 | | 38E-1 | J=108, 38E+15 | AM(108, 38E+15), M(48, 266E-1), CV(16-19, 76), |
| A-NV-ذ | AM | 19E+1 | 266E-1 | | 627E-3 | 646E10 | | M(38, 6.14) |
| A-NV-ر | | 513 | 133 | | | 76E-1 | J=112,Am19 E-1 | M(38, 41.3), M(84, 19), m(104, 266E-1) |
| A-NV-ز | | 513E-1 | 57E-1 | | | | | M(16, 38/361E-1) |
| A-NV-س | | 228 | | 114E-2 | M 19E-1 | | | AM(2,228), M(38, 6.79) |
| A-NV-ش | | | | M 475 ext | | | | M(38, 620), m(58, 228ext) |
| A-NV-ص | | | m 19 | m 76E-1 | | 247E-4 | | AM(2,66.7), M(57, 3.14), m(76, 0.861) |
| A-NV-ض | AM 57 ext | | 361E-5 | 722E36 | | | | |
| A-NV-ط | 38/361 E-1 | M 38 | 19E-1 | 171E-4 | | | | AM(70, 38E+8/361E+7), |
| A-NV-ظ | | | 38E16 | | | | | M(8, 748), m(10, 19E-2) |
| A-NV-ع | 38E+1 | AM | 152 | | | | | M(4, 342), M(38, 50.0), M(57(28.2), m(50,19) |
| A-NV-غ | AM 38 | 342E-1 | 665E-2 | | | | | m(4, 304E-1), M(30, 228E-2) |
| A-NV-ف | 418 | | 76E+1 | 1444 | 646E+ 10 | | | M(12,95E+1/931ext), M(72, 38E+4), m(78, 57E+3) |
| A-NV-ق | | M 285 | | | | | | m(38, 10.418), M(57, 7.345), AM(96, 57E+8) |
| A-NV-ك | | | 38/361E -1 | M 133E+ 1 | 19 | J=108, 38E-24 | | M(40,38), m(72, 266E-2), M(76, 4.63), AM(102, 228E+4) |
| A-NV-ل | | | 38X10ext | | 38E-1 | | | m(72,19), M(76, 22.24), m(94, 361E-2), M(104, 38) |
| A-NV-م | | | | 38 | M 266E-1 | 114E-1 | J=112,817E- 2 | m(72, 19), M(104, 19E+1) |
| A-NV-ن | | | 38 | | M 19 | | | |
| A-NV-هـ | | 19E+1 | M 76 | | M 76E-1 | 114E-2 | | CV(16-22, 19E+1) |
| A-NV-و | AM | | | 95E-1 | 608E-2 | 76E-2 | | M(38, 29.2), M(104, 57E-1) |
| A-NV-ى | | 114E+1 | | | | | | |
| A-NV-ي | | | 456 | | M 228E-1 | | | M(38, 147.8), |
| alpha(e)NV- verses | -38 | | m 133 | | | | 112,19/209E -1 | M(28, -19E+2/-1710ext), M(76, 42.1) |
| alpha(e)NV- words | | | | 38 | | 19 | | AM(32, 95E+1), M(38, 145.8), M(76, 32.9) |
| alpha(e)NV- letters | | -57 | M | 38 | | 19 | | M(76,34.9) |
| alpha(e)NV- الف | | -57 | | 19E+1 | | 19 | J=112, 608E-1 | AM(30, 19X241ext), M(38, 108.6), m(94, 19) |
| alpha(e)NV- | -247E-1 | -513E-1 | 152 | 342E-1 | | 38 | | M(54, 38ext), m(72, 285E-1) |

| | | | | |
|---|-------------|-----------|----------|---|
| ب | alpha(e)NV- | M | M 342E-1 | AM(42, 437), m(94, 95E-1) |
| ت | | -38/-399E | | |
| | | -1 | | |
| ث | alpha(e)NV- | | -304E- | M(10, -19), m(40, -266E-1), AM(54, 38) |
| | | | 3 | |
| ج | alpha(e)NV- | M -19 | 57E-4 | J=96, M(56, 323ext), Am(60, -171ext), m(64,-114ext), M(76, 4.86) |
| | | | 152E-5 | |
| ح | alpha(e)NV- | -19E+1 | 76 | M 798E-1 266E-1 Am(42, -38E+1), m(108, 19) |
| خ | alpha(e)NV- | M -19 | -133E- | -19E-4 M(22, -19), M(28, -19), m(32, -228E-1), m(76, -1.49), AM(80, 133E-2) |
| | | | 1 | |
| د | alpha(e)NV- | -475E-1 | -380 | m 266 304E-1 M(50, 19E+1), AM(56, 19E+2/209E+1), M(68, 114) |
| ذ | alpha(e)NV- | -171 | | -152E-2 Am(22, -38E+2), M(38, 50.39) |
| ر | alpha(e)NV- | -266E- | -608E-1 | 475E-1 J=112,19 m(36, 19E+1), M(38, 241), m(64,38), m(72, 38), M(80, 57), |
| | | 1 | | |
| ز | alpha(e)NV- | -285E-1 | 342E-3 | -19E-4 m(12, -19), Am(16, -38), AM(20, 38), M(36, 133E-2) |
| س | alpha(e)NV- | -38E+1 | 456E-1 | 19 CV(56-100, 19) |
| ش | alpha(e)NV- | | | |
| ص | alpha(e)NV- | -285E-1 | m 437 | M 893E-2 m(76, 24.3), M(92, 38E+1), M(95, 8.9) |
| | | | 551E-1 | |
| ض | alpha(e)NV- | -266E- | -304E-1 | M(57, 0.049), AM-Am=190.19 |
| | | 1 | | |
| ط | alpha(e)NV- | 81.7E+1 | 95E-1 | 304E-7 J=96, 19E-1 m(6,-38), m(18, 95), m(70, -266E-2), from J=76 on flats out at zero. |
| ظ | alpha(e)NV- | -285E-3 | | m(6, -19), m(12, -532E-2), from J=19 on flats out at zero |
| ع | alpha(e)NV- | -38 | AM 19 | M 304 M(38, -129.38), m(42, -38E+1), M(44,304), m(50, 114), m(72, 95), M(76, 19E+1), M(78, 114), m(90, 228E-1), ~(-80, 304) |
| | | | 437 | |
| غ | alpha(e)NV- | -304E-1 | -114 | 19E-1 AM(24, 38E+2) |
| ف | alpha(e)NV- | -19 | -19 | -152E-1 19 M(18, -19), m(50, -19), m(78, -76E-1), m(92, -228E-1), AM(98, 304E-1), m(104,19E-1) |
| ق | alpha(e)NV- | -228E-1 | | m(38, 72.8), M(57, 50.5) |
| ك | alpha(e)NV- | -41.8E-1 | Am | M 285E-1 m -76 m(34, -38E+1), M(42, 38E+1), M(57, 60.3), M(94, 57) |
| | | | -19E+2 | |
| ل | alpha(e)NV- | -247E- | -57 | M19E1/ 38/399 J=112,57 AM(34, 152E+1), M(76, 30.96) |
| | | 1 | 209 | E-1 |
| م | alpha(e)NV- | -57 | -608 | 266E-1 m(102, -19X134 ext), A distinct breaking point observed at J=38 |
| ن | alpha(e)NV- | | | |
| ه | alpha(e)NV- | -228E- | M -38 | 152E-1 M(38, -128.1), m(52, 57), M(76, 30.7) |
| | | 1 | | |
| و | alpha(e)NV- | | | J=112,19 M(38, 54.8) |
| ي | alpha(e)NV- | -38 | | 19 M(38,-120.38), M(76, 41.57), M(102, 57) |
| | | | | |
| | alpha(10)N | -874E- | -266 | 114 M 95 646E-1 M(40, 38E+1), M(104, 38E+1), Am(-38E+2) |

| | | | | | | | |
|------------|---------|-----------|-----------|--------|------------|--------------|--|
| V-verses | 1 | | | | | | |
| alpha(10)N | -57 | -57 | | 95 | M 76 | J=112,38 | M(38, 335.7) |
| V-words | | | | | | | |
| alpha(10)N | -57 | -57 | | 95 | | 456E-1 | m(36, 38E+1/361), M(76, 80.4) |
| V-letters | | | | | | | |
| alpha(10)N | -57 | | -133 | 76/779 | | | Am(30, -19X555 ext), AM(32, 19E+2, ext), M(38, 250.1), M76, 73.63),M(90, 532E-1) |
| الف | | | | E-1 | | | |
| alpha(10)N | -57 | -57 | | | | 703E-1 | Am(32, -19X65ext), M(88, 95), m(102, 19E+1/209) |
| ب | | | | | | | |
| alpha(10)N | | | m -95 | | | 228E-1 | J=110, M(76, 78.9), M(106, 19E+1ext) |
| ت | | | | | | -266E-1 | |
| alpha(10)N | | -57 | -247E-1 | | | | |
| ث | | | | | | | |
| alpha(10)N | -57 | | -494E-1 | AM | | 133E-4 | M(38, -42.1), Am(60, -38E+1), M(76, 11.19) |
| ج | | | | 76E+1 | | | |
| alpha(10)N | | | | 228 | 19E+1 | | AM(44, 19E+2), M(76, 19E+1) |
| ح | | | | | | | |
| alpha(10)N | -57 | | -494E-1 | | | | AM(80, 304E-2), m(50, -57), M(46, 38/399E-1), M(38, -41.6), M(76, -3.44) |
| خ | | | | | | | |
| alpha(10)N | | | | | | 76 | Am(46, -19X271), m(36, -152), M(57, 611), M(100, 19E+1) |
| د | | | | | | | |
| alpha(10)N | | | -38E+1 | 114 | 38 | -665E-2 | J=106, AM(24, 19X73), sharp M(90, 19X43), M(38, ~114) |
| ذ | | | | | | 38E-3 | |
| alpha(10)N | -57 | | M | 988E-1 | 114 | 627E-1 | 112,38/399E Am(30, -38E+2/-361E+1), AM(32, 19X97), M(104, 19E+1) |
| ر | | | 57E+1 | | | -1 | |
| alpha(10)N | | | -38/-36.1 | | -19E+1/-17 | | AM(20, 893E-1), m(38, 0.79) |
| ز | | | | | 1E-7 | | |
| alpha(10)N | -57 | | M | 437E-1 | | | AM(20, 19X123ext), M(76, 53.91) |
| س | | | 1045E- | | | 38/361 | |
| | | | 1 | | | E-1 | |
| alpha(10)N | -646E- | | M | -19E-2 | -19E-5 | J=95, -19E-5 | from J=76 on, flats out at zero |
| ش | 1 | | -285E- | | | | |
| | | | 1 | | | | |
| alpha(10)N | | -171 | m | 57 | 19 | J=104, | |
| ص | | | 19X53 | | | -285E-4 | |
| alpha(10)N | | -703E-1 | | 114E-3 | | | Am(10, -323), AM(12, 114ext) |
| ض | | | | | | | |
| alpha(10)N | -684E-1 | 19X10ext | | 361E-2 | -19E-1 | | M(32, 38), M(36, 38) |
| ط | | | | | | | |
| alpha(10)N | | | -152E-6 | | | | M(10, 323E-1), AM(14, 38) |
| ظ | | | | | | | |
| alpha(10)N | -532E-1 | | m | | M | | M(38, 298), m(42,-19X47), M(44, 19X37), M(76,413.7) |
| ع | | | 38E+1 | | 19X37 | | |
| alpha(10)N | | -266 ext | | | | | M(14, -38E+1ext), Am(20,-19E+2/-19X105), M(36, 95) |
| غ | | | | | | | |
| alpha(10)N | | -418E-1 | | | 57 | | M(12, -38), m(78, -19), AM(98, 703E-1) |
| ف | | | | | | | |
| alpha(10)N | -532E-1 | | | | -19 | | M(22, -38E+1), m(38, 167), M(40, 228), M(57, 116.2) |
| ق | | -38E+1ext | | | | | |
| alpha(10)N | -532E- | w-95 | | 114ext | M | | M(76, 65.7), Am(38, -4061) |
| ك | 1 | | | | 19E+1 | | |
| alpha(10)N | -57 | -57 | | | m 38 | J=112,133 | AM(34, 19X186), M(38, 480.0), M(76, 71.2), |
| ل | | | | | | | |
| alpha(10)N | -57 | | | | 76 | | M(76,102), m(86, 57), m(102, -57E+2), M(108, 190 ext) |
| م | | | | | | | |
| alpha(10)N | | | 152ext | | | J=112,19 | M(76, 80.4), Am(28, -19x55), AM(30, 19x86) |

| | | | | |
|---------------|-----------|--------|--|--|
| V_{α} | | | | |
| $\alpha(10)N$ | m -95ext | J=112, | M(38, -295), Am(42, -57E+1), M(76, 70.7) | |
| V_{α} | | 342E-1 | | |
| $\alpha(10)N$ | | 57 | m(64, 57), M(88, 342E-1) | |
| V_{β} | -209/-19E | | | |
| V_{β} | -1 | | | |
| $\alpha(10)N$ | | M 95 | J=112,38 | M(38, -277), AM(44, 19E+2), M(102, 133ext) |
| V_{α} | | | | |

NBFS Couplings and effects observed for the F-parameters A and alpha, as computed for the Natural Variations of the specified characters in Quran.

9.6 F-plots of the 62 Principle Variations in Quran - General Descriptions

Figures that follow will have their explanations in their captions if necessary, and in any case descriptions can be found in Table 5 for the Sorted, and in Table 6, for the Natural Variations. In all these F-plots, the x-axis represents J values, and the y-axis unless otherwise shown, has its units in multiples of 19 but in different orders of magnitude (depending on the magnitude of the F-parameter plotted).

It has been tried to show as many of the F-plots as possible, so that combined with the information specified in Tables 5-6, a good picture of the NBF Structure of Quran can be presented. The reader can clearly observe from these F-plots, different features and individualities of the NBF regulations for different Principle Variations in Quran. We shall start with the F-plots of the Sorted Variation of verses in Quran.

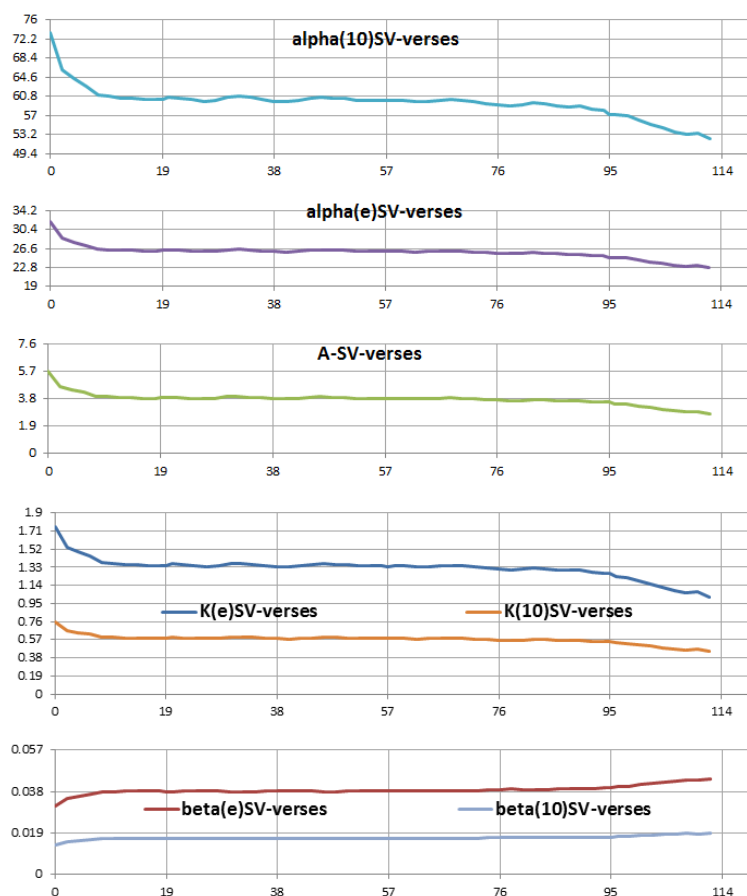


Figure 20. F-plots of the Sorted Variation of verses

Observe here, one of the most impressive constant value regulations of the F-parameters in Quran: $\alpha(e)SV$ and $\alpha(10)SV$ maintain UB (Upper Bounds) at MN(26.6) and MN(60.8), respectively. A-SV starts at MN(5.7) and maintains a CV at MN(3.8). K(e)SV maintains a CV at MN(1.33), and K(10)SV starts at exactly MN(0.76) and maintains a CV at MN(0.57). Meantime, $\beta(e)SV$ maintains a CV at MN(0.038), and $\beta(10)SV$ which is the smallest F-parameter of all, terminates at J=112 with an exact value MN(0.0190). To realize the precision

of these tunings observe their sensitivity tests in Figure 85.

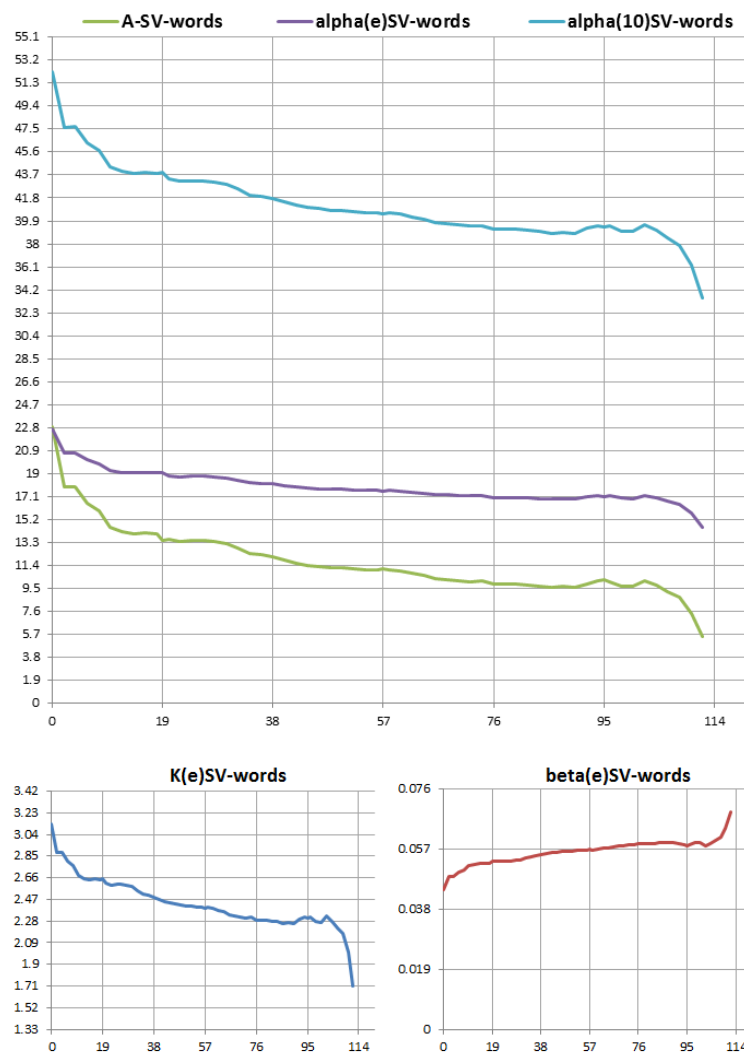


Figure 21. F-plots of the Sorted Variation of words in Quran

Observe as $\alpha(10)SV$ makes consecutive couplings at (2, 47.5), (19, 43.7), and (38, 41.8). Also, $\alpha(e)SV$ starts at (0, 22.8) makes a Fundamental (19,19) coupling followed by two other couplings at $J=76$ and $J=95$. Base-independent $A-SV$ starts exactly at the same point as $\alpha(e)SV$ at (0, 22.8) and makes a coupling at (19, 13.3). Not shown in Table 5, $K(e)SV$ makes a coupling at (19, 2.66) followed by another coupling at (76, 2.28) and terminates at exactly (112, 1.71). Also, $\beta(e)SV$ shows a central coupling at (57, 0.057). See other effects from Table 5.

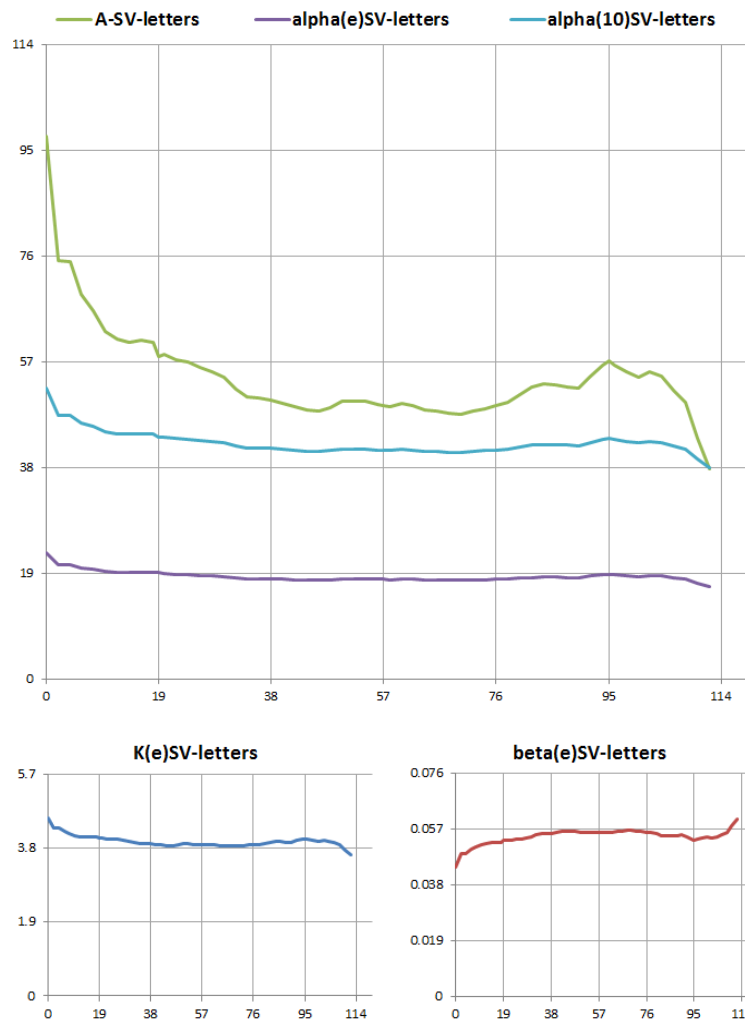


Figure 22. F-plots of the Sorted Variation of (total) letters in Quran

A-SV makes couplings at (2, 76), (19, 57), and makes a maximum at M(95, 57) with a terminal point at (112, 38), exactly in common with alpha(10)SV. Also, alpha(e)SV while making a Fundamental (19,19) coupling, maintains a long range constant value (CV) at MN(19). Not shown in Table 5, K(e)SV makes 3 consecutive couplings at (38, 3.8) (57, 3.8) and (76, 3.8). Meantime, beta(e)SV makes 3 consecutive couplings at (38, 0.057) (57, 0.057) and (76, 0.057). See other effects from Table 5.

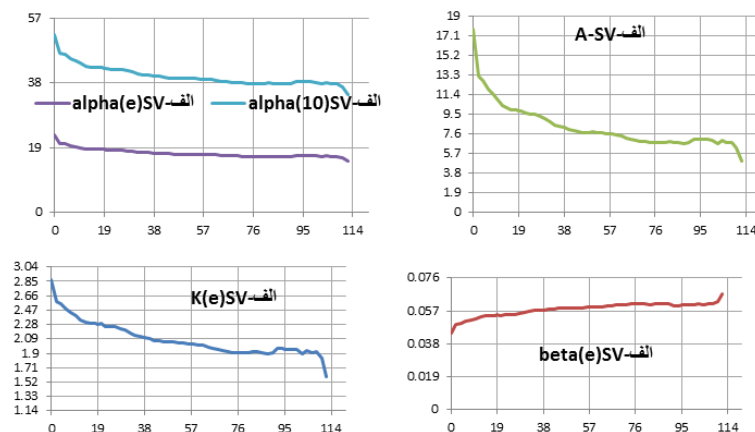


Figure 23. F-plots of the Sorted Variation of letter alif (الف or ا) in Quran

Not seen from Table 5: K(e)SV starts at nearly MN(2.85), makes couplings at (19, 2.28), (38, 2.09), and makes both a minimum and a precise coupling at m(76, 1.90). Meantime, beta(e)SV, while maintaining a CV from J=38

to J=57, makes two couplings at (38, 0.057), and (57, 0.057) and terminates at J=112 with a 3-d value MN(0.0665). See other effects from Table 5 and note also the Fundamental Coupling at (19, 19) for alpha(e)SV.

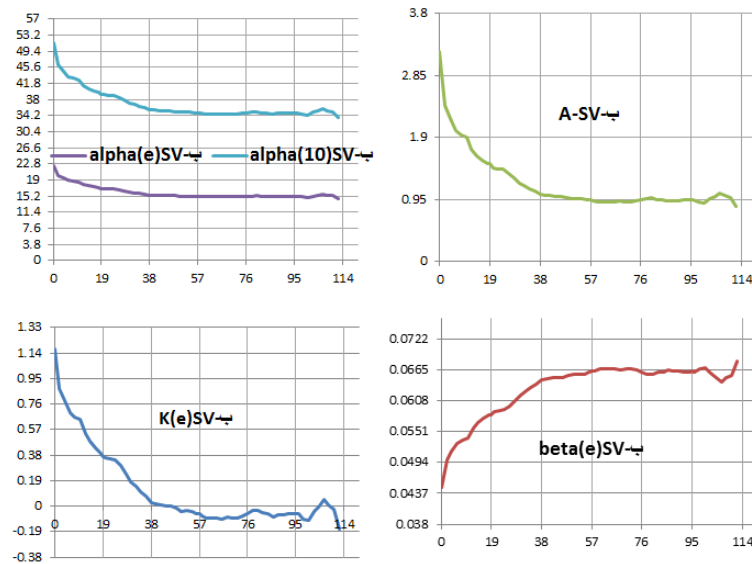
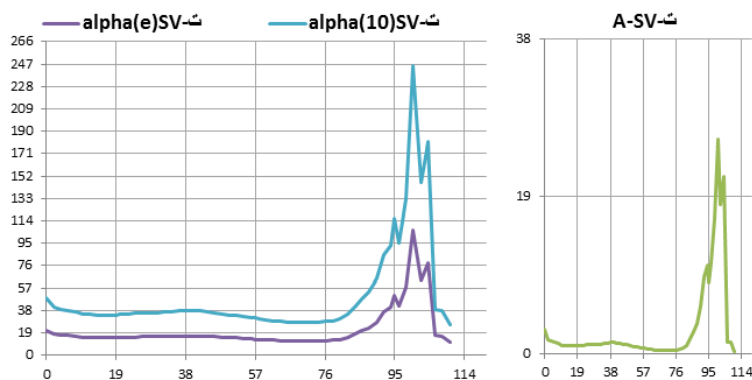


Figure 24. F-plots of the Sorted Variation of letter beh (ب) in Quran

Not seen from Table 5: K(e)SV starts at nearly MN(1.14) makes a coupling at (19, 0.38) makes another coupling at nearly (38, 0.0266) and terminates at J=112 with a value -MN(1.90). Meantime, $\beta(e)SV$ makes a coupling at (19, 0.057) and maintains a CV at a 3-d MN(0.0665) from J=57 to J=95.



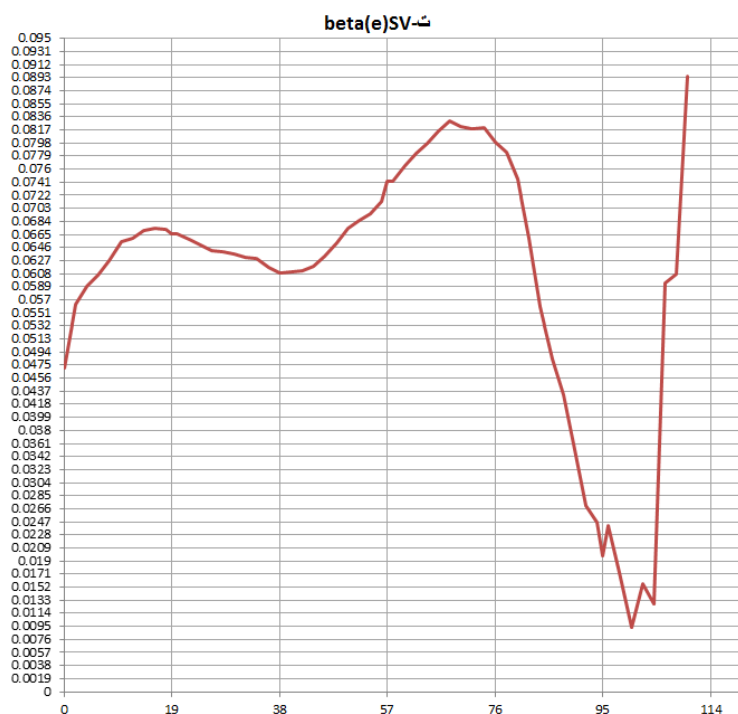
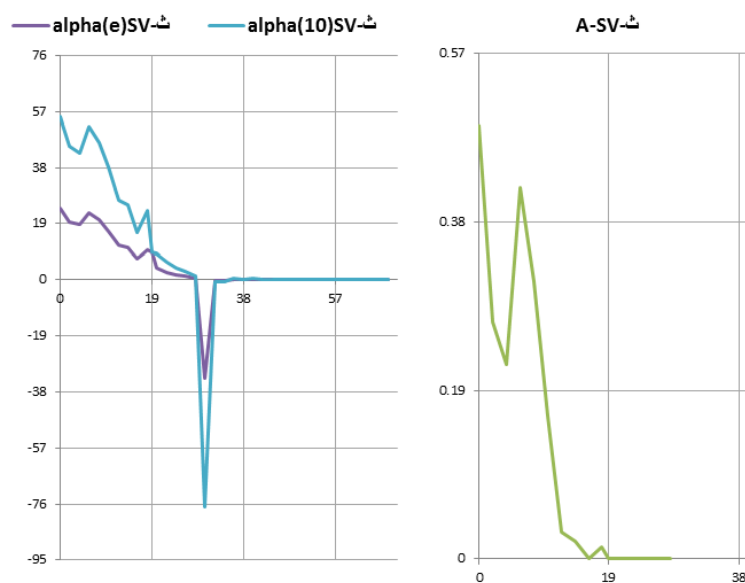


Figure 25. F-plots of the Sorted Variation of letter teh (ت) in Quran

Not seen from Table 5: K(e)SV shows a (2, 0.057) at the first introduction of the Fourier terms, makes a 3-d MN coupling at (19, 0.0665), makes a minimum and coupling at m(38, 0.0608), makes another coupling at (57, 0.0741), a 2-d MN coupling at (95, 0.019), makes an absolute minimum at Am(100, 0.0095) and terminates with a 3-d value MN at (112, 0.0893).



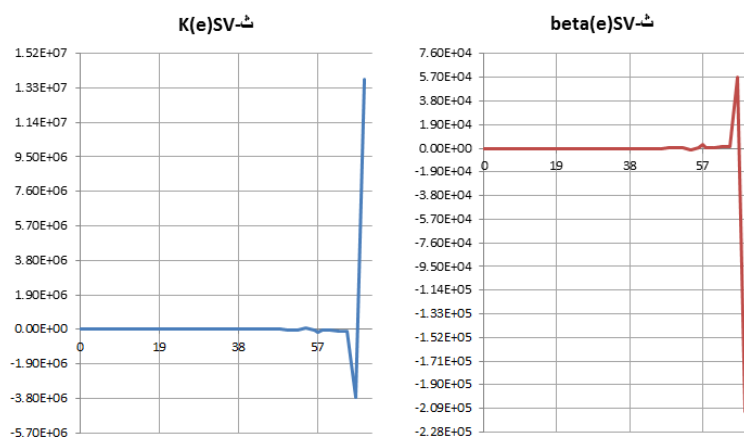


Figure 26. F-plots of the Sorted Variation of letter theh (ث) in Quran

Not seen from Table 5: K(e)SV shows the following couplings and effects: (2, -1.33), (57, -19E4), and an absolute minimum at Am(66, -38E5). Also, beta(e)SV shows couplings at (0, 0.0418), (19, 0.247), and (38, 19), and an absolute maximum at AM(66, 57E3), followed by an absolute minimum at Am(68, -209E3).

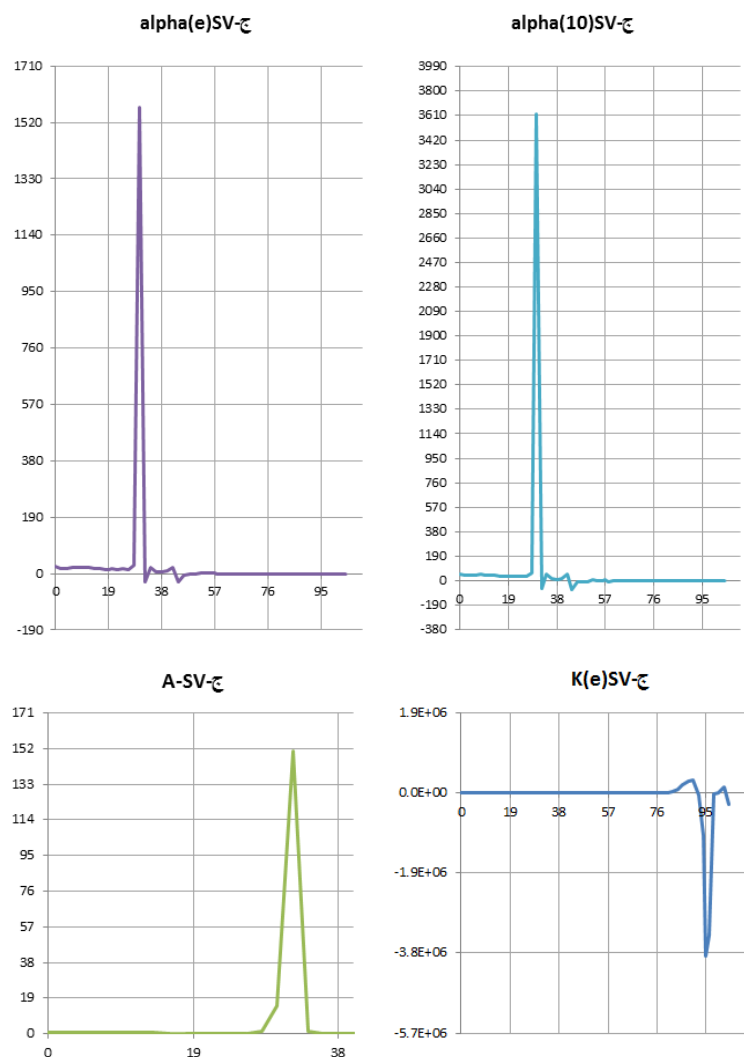


Figure 27. F-plots of the Sorted Variation of letter jim (ج) in Quran

Not seen from Table 5: K(e)SV shows a simultaneous coupling and absolute minimum at (95, -38E5). See other effects from the Table.

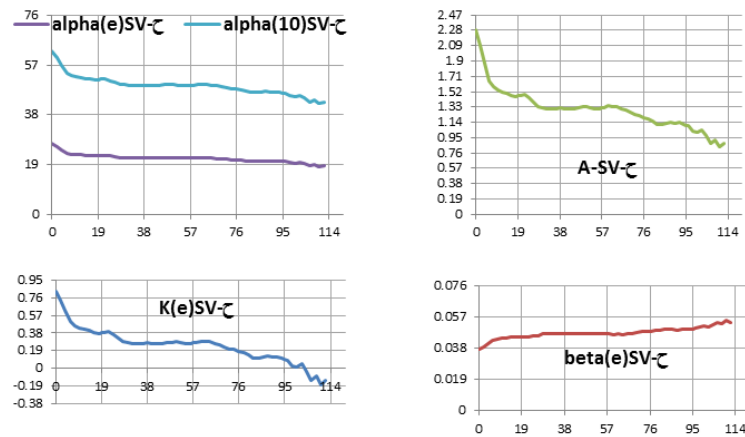


Figure 28. F-plots of the Sorted Variation of letter ha (ح) in Quran

Not seen from Table 5: K(e)SV shows couplings at (19, 0.38), (76, 0.19), and an absolute minimum at Am(110, -0.19). Meantime, beta(e)SV starts at (0, 0.038) and shows a 3-d MN coupling at (95, 0.0494).

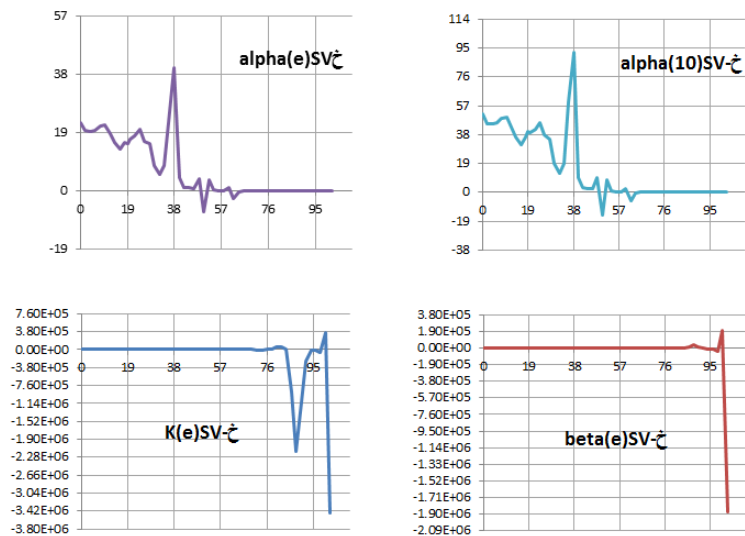


Figure 29. F-plots of the Sorted Variation of letter kha (خ) in Quran

Not seen from Table 5: K(e)SV shows couplings at (0, -0.38), (19, -1.14), and an absolute maximum at Am(100, 38E4). Meantime, beta(e)SV shows coupling at (19, 0.057), an absolute maximum at AM(100, 19E4), and an absolute minimum at Am(102, -190E4).

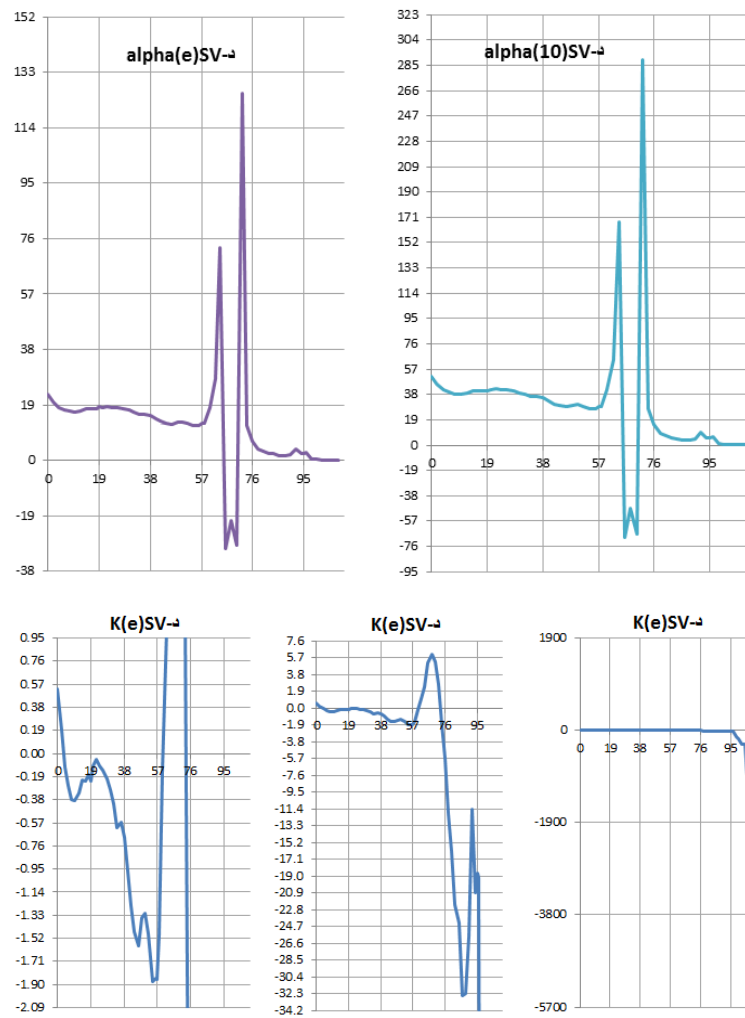


Figure 30. F-plots of the Sorted Variation of letter dal (ﺩ) in Quran

Not seen from Table 5, and just as an example for seeing the fine details, $K(e)SV$ is shown in over four orders of magnitude; Couplings are observed at (0, 0.532), (2, 0.19), (38, -0.684), (57, -1.9), (76, -5.7), (95, -19), and an absolute minimum and termination is established at Am(108, -38E2). Other MN valued maxima and minima can also be observed from the graphs.

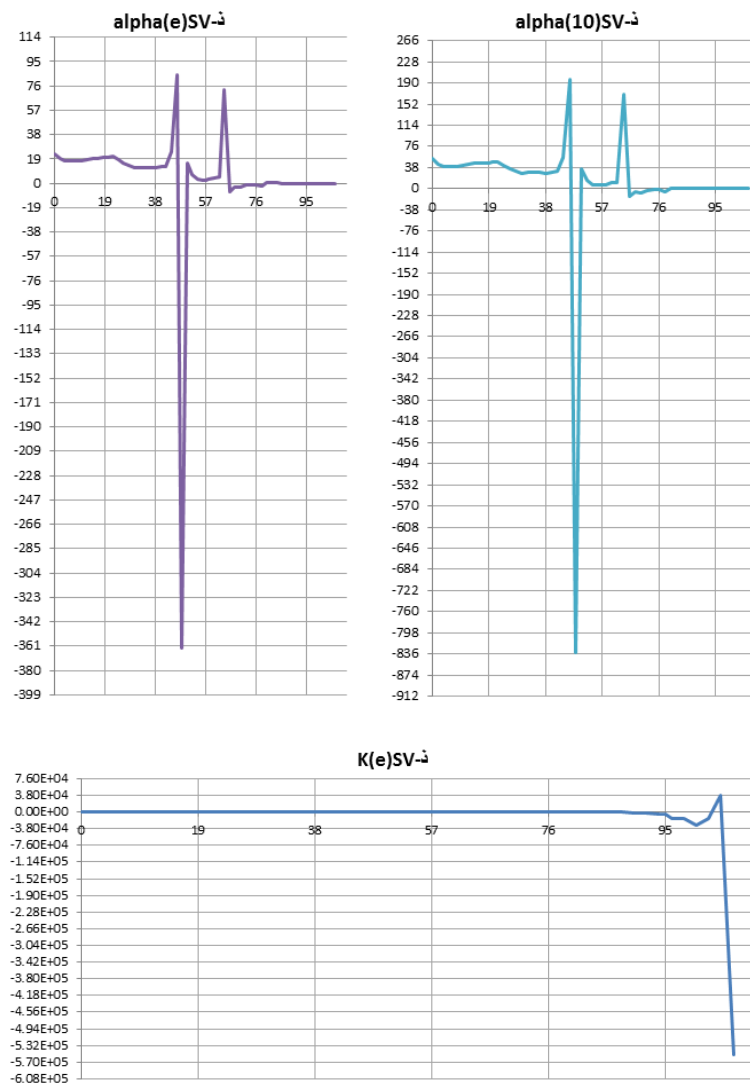


Figure 31. F-plots of the Sorted Variation of letter dhal (ذ) in Quran
 Not seen from Table 5, $K(e)SV$ shows couplings at (19, 0.114), (38, -1.9), (57, -19), and scores an absolute maximum at $Am(104, 38E3)$, before computation terminates at $J=106$.

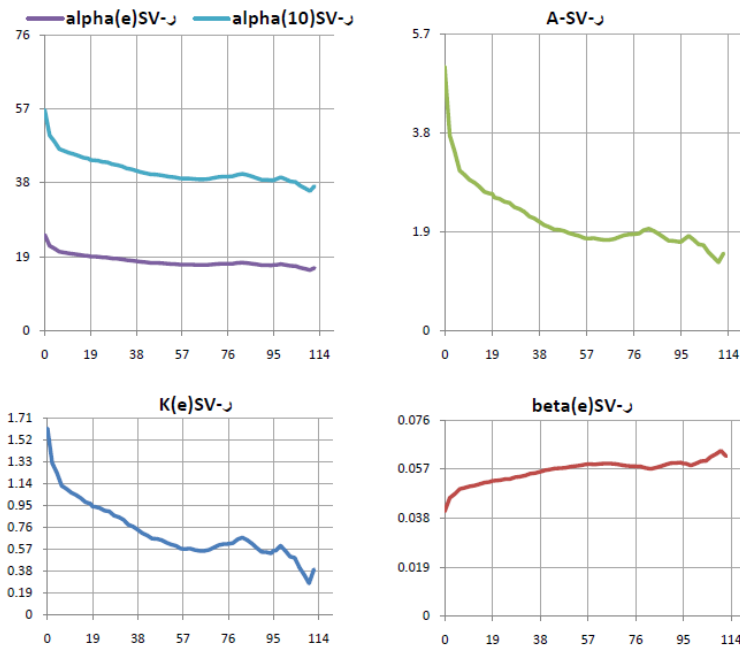


Figure 32. F-plots of the Sorted Variation of letter ra (ر) in Quran

Not seen from Table 5, K(e)SV shows couplings at (2, 1.33), (19, 0.95), (57, 0.57), and terminates at (112, 0.38). Meantime, beta(e)SV shows a CV(36-86, 0.057) which includes 3 couplings at J=38, J=57, and J=76 with the MN value of 0.057. Notice also, the Fundamental Coupling at (19, 19) for alpha(e)SV.

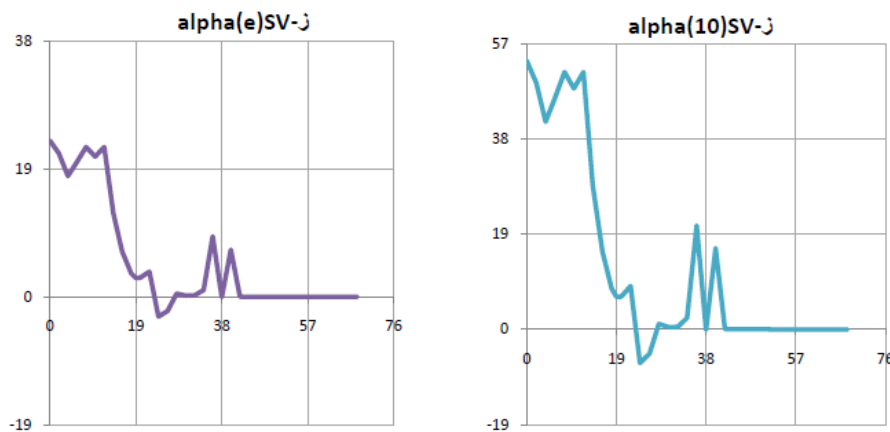


Figure 33a. F-plots of alphas for letter zin (ز), as computed for its Sorted Variation in Quran

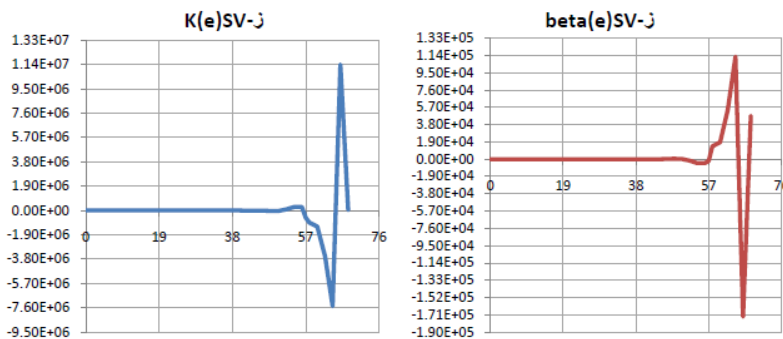


Figure 33b. F-plots of the Sorted Variation of letter zin (ز) in Quran

Not seen from Table 5, K(e)SV shows couplings at (2, -0.95), (57, -57E4), and establishes an absolute minimum at Am(64, -7.6E5) followed by an absolute maximum at AM(68, 114E5). Meantime, beta(e)SV shows coupling at (57, -19E2), an absolute maximum at AM(64, 114E3), and an absolute minimum at Am(66, -171E3).

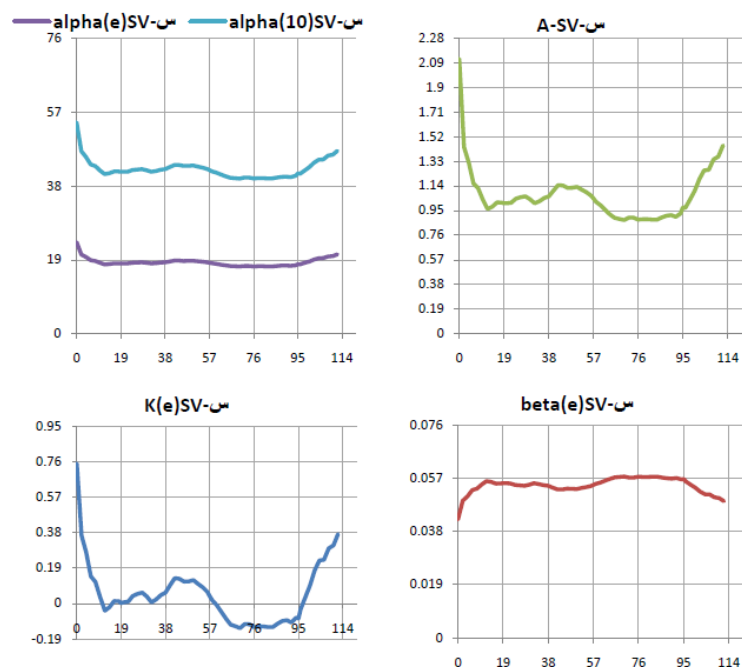
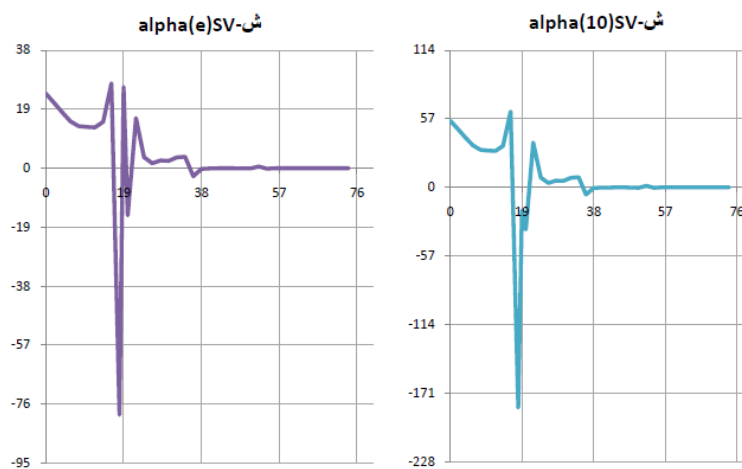


Figure 34. F-plots of the Sorted Variation of letter sin (س) in Quran

Not seen from Table 5, K(e)SV shows couplings at (0, 0.76), (2, 0.38), (19, 152E-5), (38, 0.057), (57, 0.038), and terminates at (112, 0.38). Also, beta(e)SV shows coupling at (19, 0.057), and a CV(52-96, 0.057) while making two couplings at J=76, and J=95 with a MN value of 0.057. Notice also, the Fundamental Coupling at (19, 19) for alpha(e)SV.



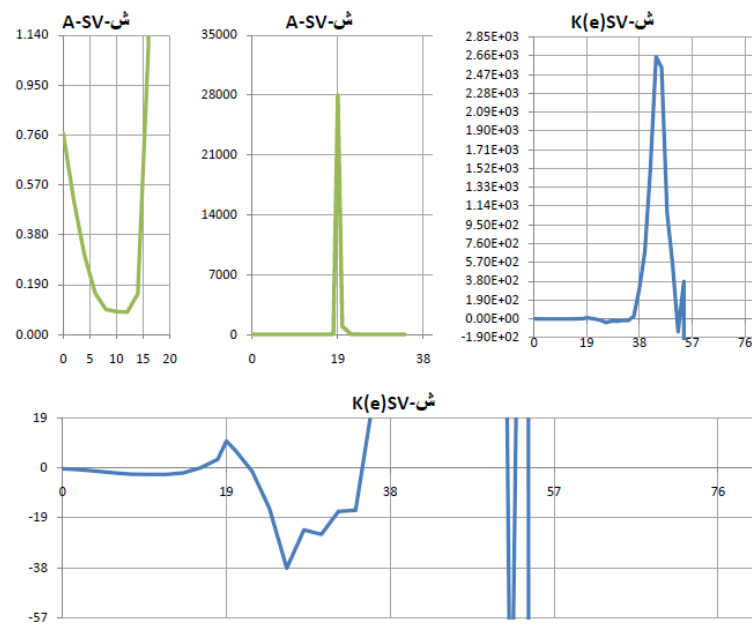
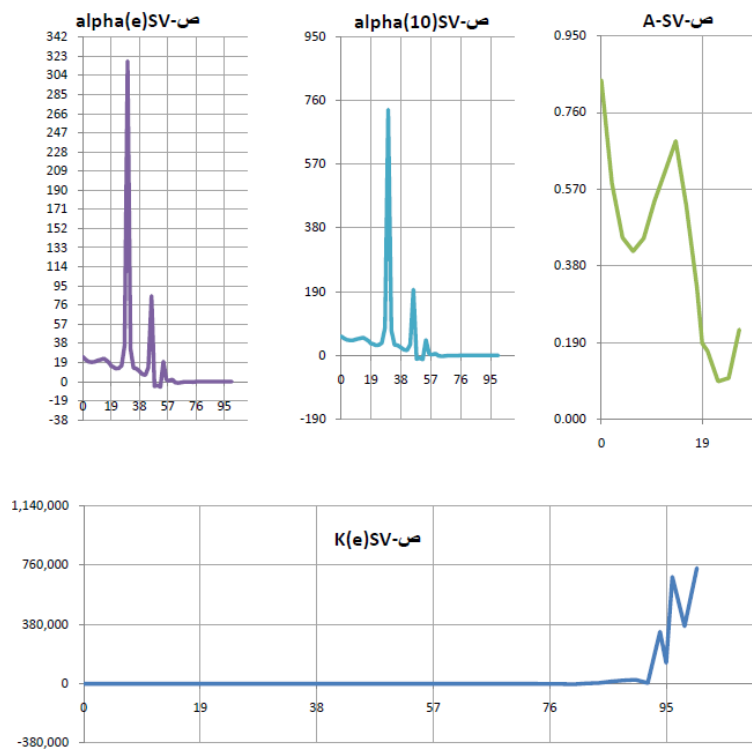


Figure 35. F-plots of the Sorted Variation of letter shin (ش) in Quran

Not seen from Table 5, K(e)SV is shown in two different orders of magnitude; it shows a coupling at (0, -0.266), a minimum at m(12, -2.47), a maximum at M(19, 10.26), a minimum at m(26, -38), and an absolute maximum at AM(44, 266E1), followed by a maximum at M(54, 380).



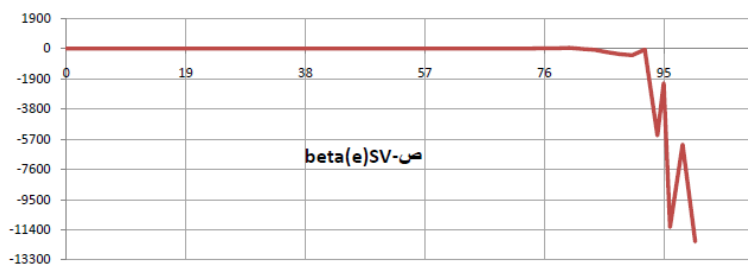


Figure 36. F-plots of the Sorted Variation of letter sad (ص) in Quran

Not seen from Table 5, K(e)SV shows a coupling at (19, -1.14), an absolute minimum at Am(80, -247E1), a minimum at m(92, 475E1), a both, coupling and minimum at m(95, 133E3), a maximum at M(96, 684E3), a minimum at m(98, 38E4), and terminates at an absolute maximum AM(100, 76E4). Meantime, beta(e)SV shows couplings at (0, 0.038), (19, 0.057), (38, 0.095), (57, 0.57), and (76, 19), with a maximum at M(92, -76), and a minimum at m(96, -114E2).

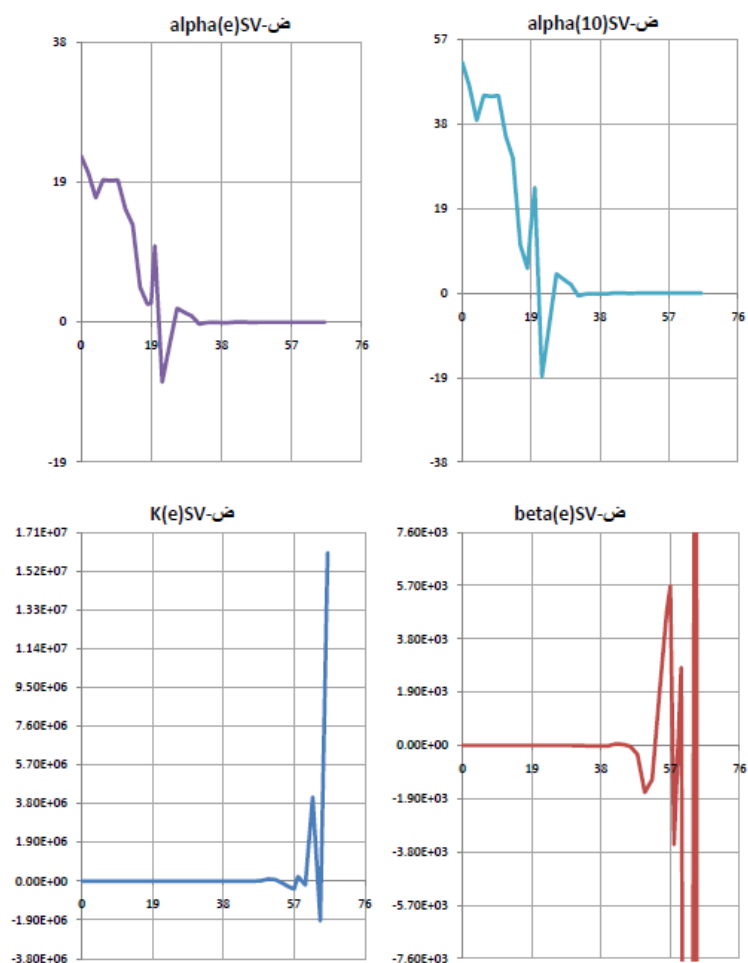


Figure 37. F-plots of the Sorted Variation of letter dad (ض) in Quran

Not seen from Table 5, K(e)SV shows couplings at (0, -0.76), (19, 7.6), an exact 4-d (38, 1102), a 3-d (57, -380E2), a maximum at M(58, 228E3), a minimum at m(60, -19E4), and an absolute minimum at Am(64, -19E5). Meantime, beta(e)SV shows coupling at (19, 0.38), coupling and maximum at M(57, 570E1), and not seen from the graph, a sharp 3-d MN minimum at m(62, -627E2).

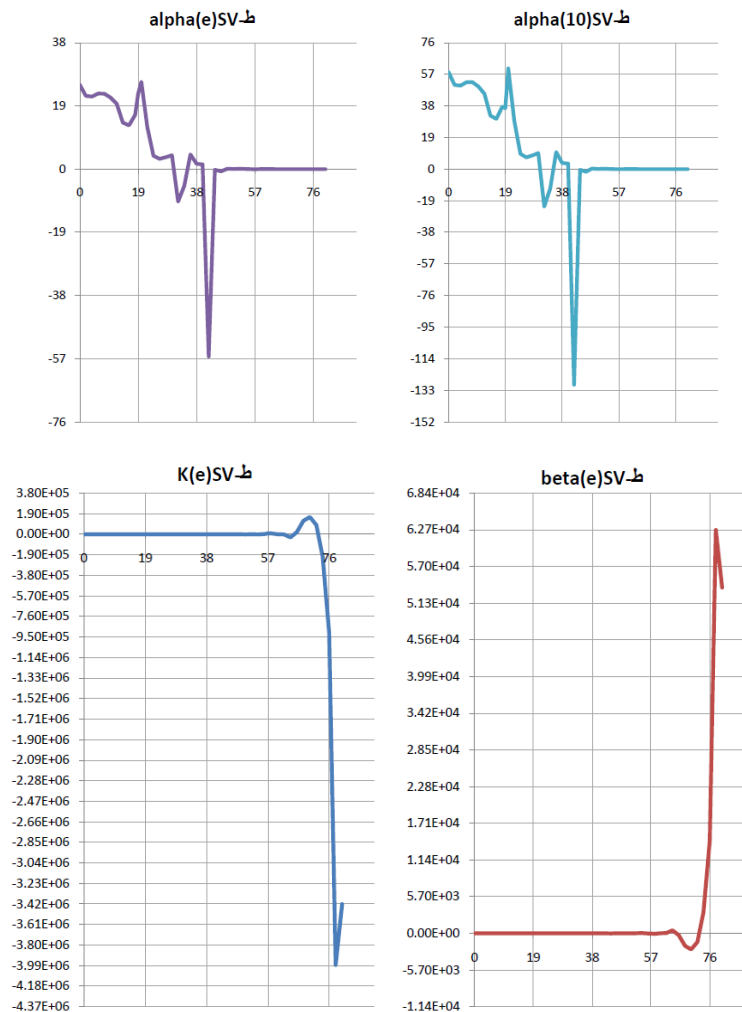
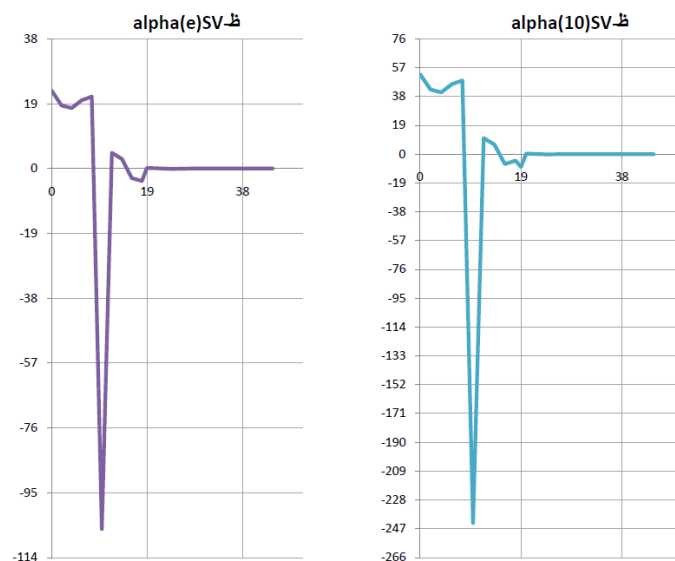


Figure 38. F-plots of the Sorted Variation of letter ta (ط) in Quran

Not seen from Table 5, $K(e)SV$ shows couplings at (19, 2.09), (38, -38), (57, 76E2), an absolute maximum exactly at $AM(70, 19 \times 8315)$, an absolute minimum at $Am(78, -399E4)$, and terminates at $J=80$ with a MN value $-342E4$. Meantime, $\beta(e)SV$ shows couplings at (0, 0.038), (2, 456E-4), and (57, -11.4), and shows an absolute minimum at $Am(70, -247E1)$ and an absolute maximum at $AM(78, 627E2)$.



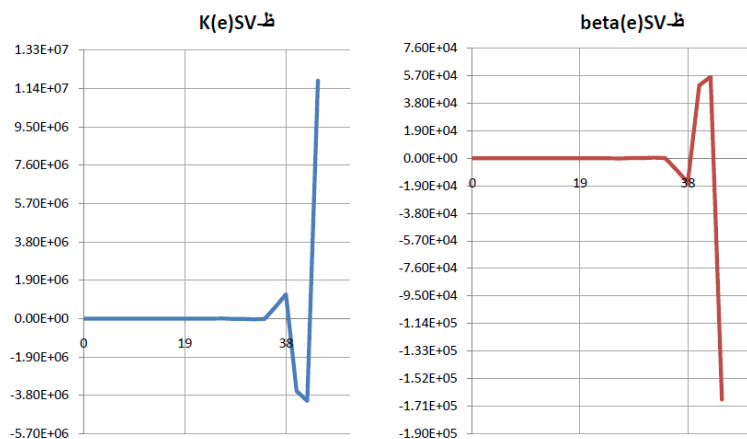


Figure 39. F-plots of the Sorted Variation of letter dha (ظ) in Quran

Not seen from Table 5, K(e)SV shows a coupling at (19, -38E1), and a maximum at J=38. Also, beta(e)SV shows couplings at (0, 437E-4), and (19, 5.32), and shows a minimum at J=38, followed by an absolute maximum at AM(42, 57E3) before its termination at J=44.

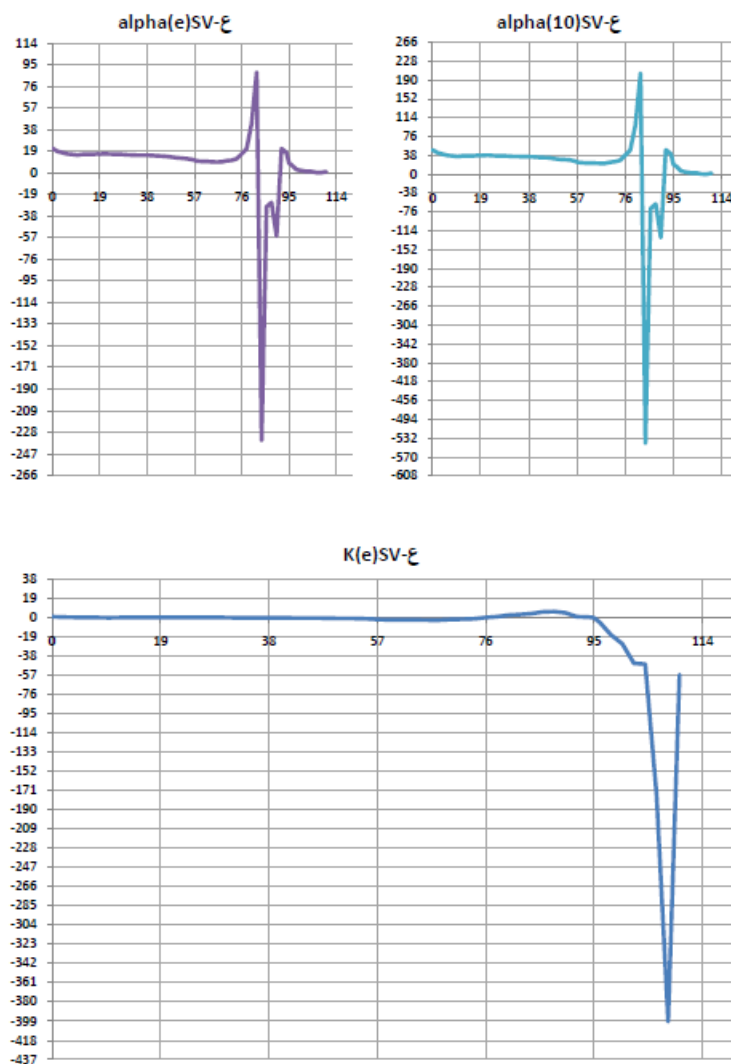


Figure 40. F-plots of the Sorted Variation of letter ain (ع) in Quran

Not seen from Table 5, K(e)SV shows 3-d MNs couplings at (0, 0.798), and (19, 437E-6), a 2-d MN coupling at (57, -1.9), an absolute maximum at AM(88, 5.7), followed by an absolute minimum exactly at (108, -399) and terminates at J=110 at an exact MN(-57).

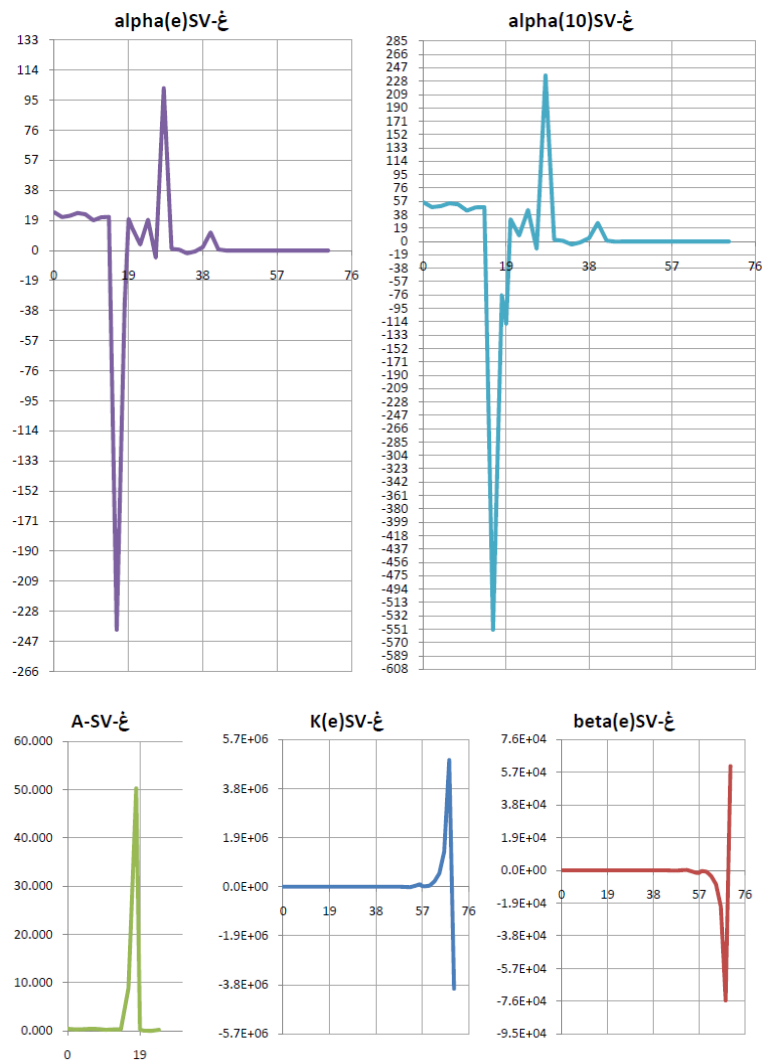
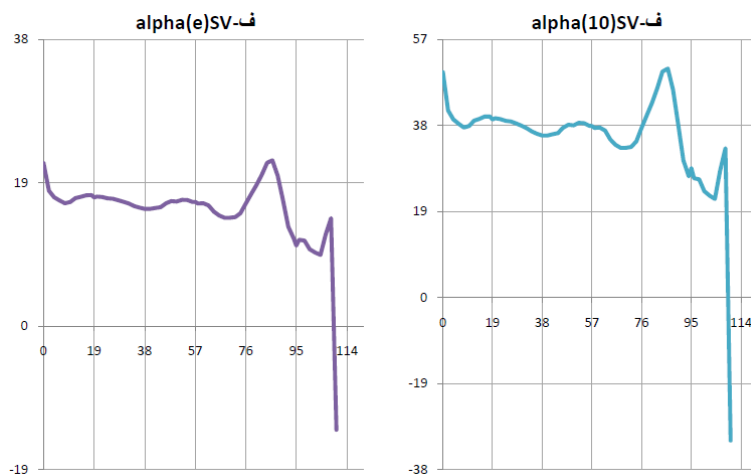


Figure 41. F-plots of the Sorted Variation of letter ghain (غ) in Quran

Not seen from Table 5, $K(e)SV$ shows couplings at (19, -1.33), (38, -26.6), (57, 266E2), and an absolute minimum and terminal point at $Am(70, -38E5)$. Also, $\beta(e)SV$ shows coupling at (19, -0.019), an absolute minimum at $Am(68, -76E3)$, and an absolute maximum at $AM(70, 608E2)$.



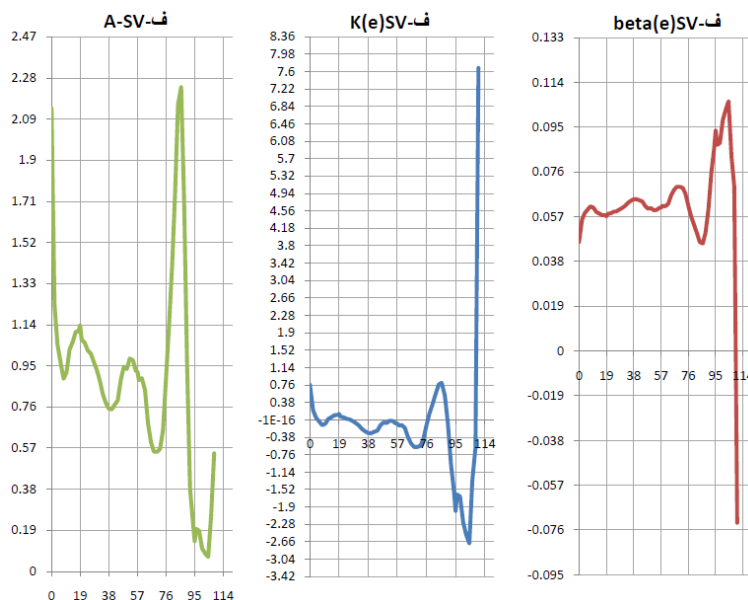


Figure 42. F-plots of the Sorted Variation of letter feh (ف) in Quran

Not seen from Table 5, K(e)SV shows couplings at (0,0.76), and (38, -285), and a minimum at m(95, -1.9), with two other minima at m(6, -0.038), m(68, -0.57), and a maximum at (84, 0.76), and a both, termination & absolute maximum at AM(110,7.6). Meantime, beta(e)SV shows couplings at (2, 0.057), (19, 0.057), and (95, 0.095).

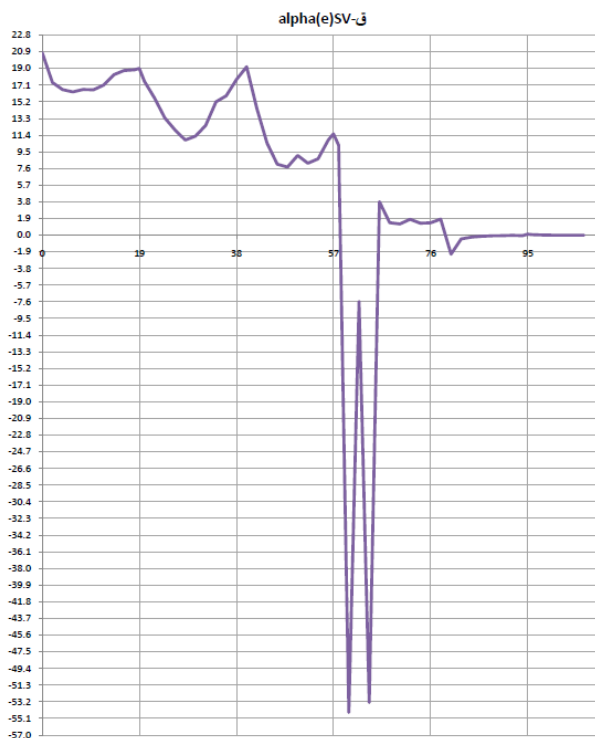


Figure 43. Plot of alpha(e)SV as computed for the Sorted Variation of letter qaf in Quran

An impressive NBF regulation of a letter in Quran: As can be seen, alpha(e)SV-ق starts at an absolute maximum AM(0, 20.9), it then makes a Fundamental Coupling and maximum at a precision regulated M(19, 19.00), alpha(e) continues to make another distinct maximum at J=40 with the value 19.19, it then scores a minimum at m(48, 7.6), makes another maximum and coupling at M(57, 11.4), it then makes a W-shape which contains 3 consecutive max-min-max points, namely, M(62, -7.6), m(64, -53.2), and M(66, 3.8). Meantime, as can be seen from the next Figure, A-SV-ق makes a distinct maximum and coupling at M(19, 1.14). To realize the astonishing precision of these NBFs regulations, observe in Figure 88, total collapse of all these effects as only one qaf is

added to, or subtracted from, each chapter in Quran. As stated before, letter qaf (ق) stands as initial for Quran, perhaps the reason for the exceptionally elegant mathematical treatments given to it in Quran.

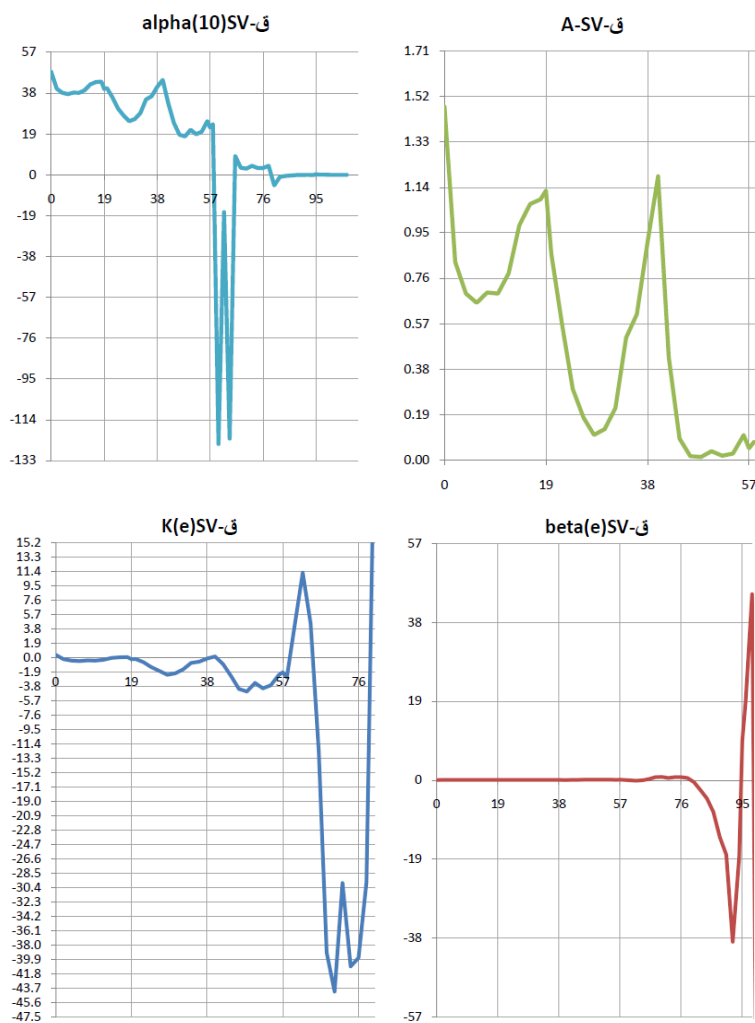
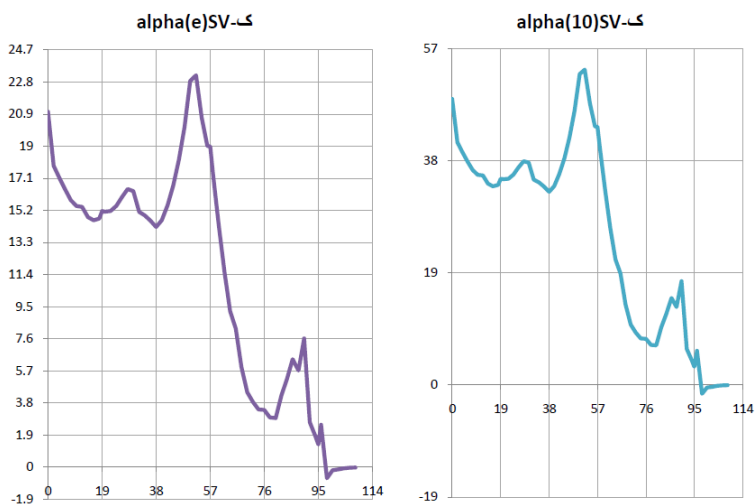


Figure 44. continued F-plots of the Sorted Variation of letter qaf (ق) in Quran

Not seen from Table 5, K(e)SV shows couplings at (0,0.38), (2, -1.9), and (19, -0.19), shows a maximum at M(40, 0.171), shows two other couplings at, (57, -1.9), and (76, -39.9) with a maximum at M(62, 11.4) in between them. Meantime, beta(e)SV shows couplings at (2, 0.057), (19, 0.057), and (38, 0.057), with a minimum at m(92, -38) followed by a coupling at (95, 9.5).



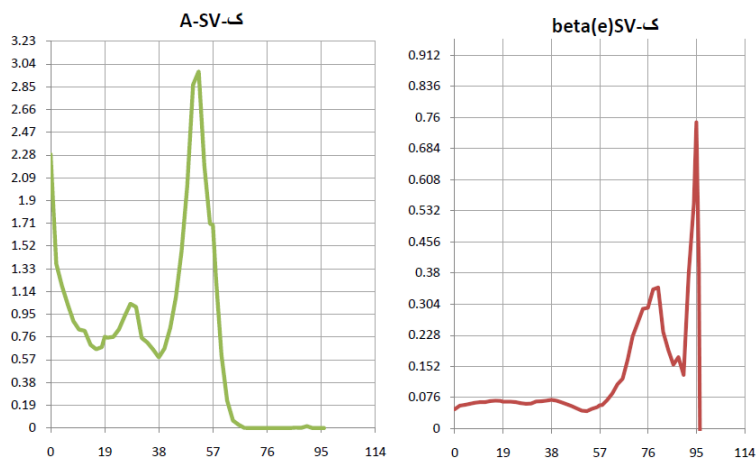


Figure 45. F-plots of the Sorted Variation of letter kaf (ك) in Quran

Not seen from Table 5, beta(e)SV shows couplings at (0, 0.0475), (2, 0.057), (38, 0.0703), (57, 0.057), and shows a maximum at M(95, 0.76), it then shows a 2-point maximum at almost M(78-80, 0.342) with another minimum at m(90, 0.133). See Table 5 for other effects.

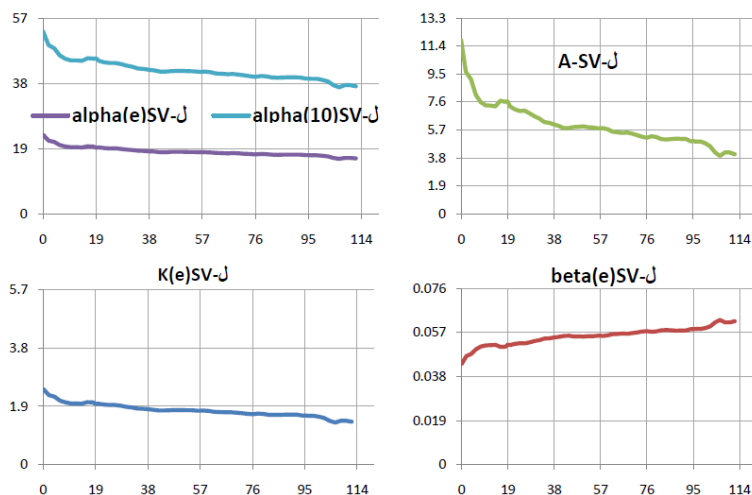


Figure 46. F-plots of the Sorted Variation of letter lam (ل) in Quran

Not seen from Table 5, K(e)SV shows couplings at (0, 2.47), and (2, 2.28), shows a CV(6-66, 1.9) which includes 3 couplings at J=19, 38, and 57 at MN(1.9). Meantime, beta(e)SV shows a CV(40-100, 0.057) which includes 3 consecutive couplings at J=57, 76, and 95 at MN(0.057). Notice also, the Fundamental Coupling made by alpha(e)SV at (19,19).

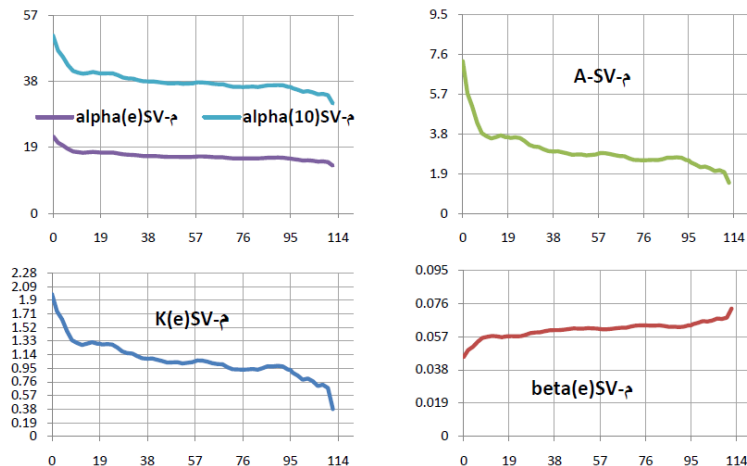


Figure 47. F-plots of the Sorted Variation of letter mim (م) in Quran

Not seen from Table 5, $K(e)SV$ shows couplings at $AM(0, 1.9)$, $(76, 0.95)$, and an absolute minimum at $Am(112, 0.38)$ which is also a terminal point. Meantime, $\beta(e)SV$ shows a $CV(6-26, 0.057)$, which includes a coupling at $(19, 0.057)$.

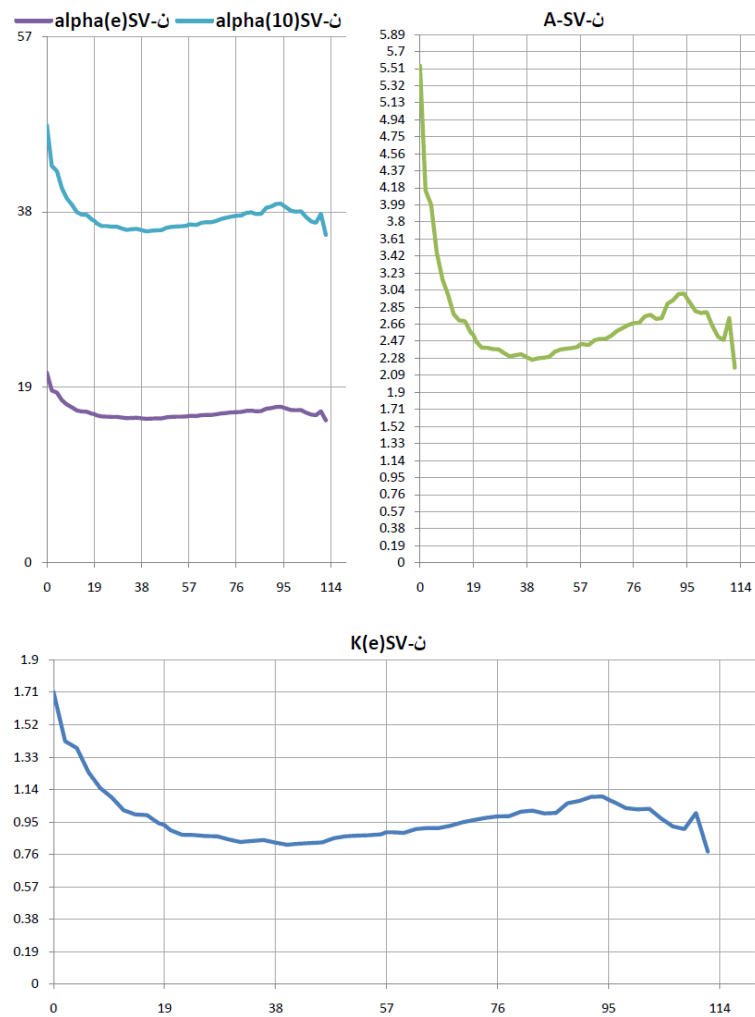
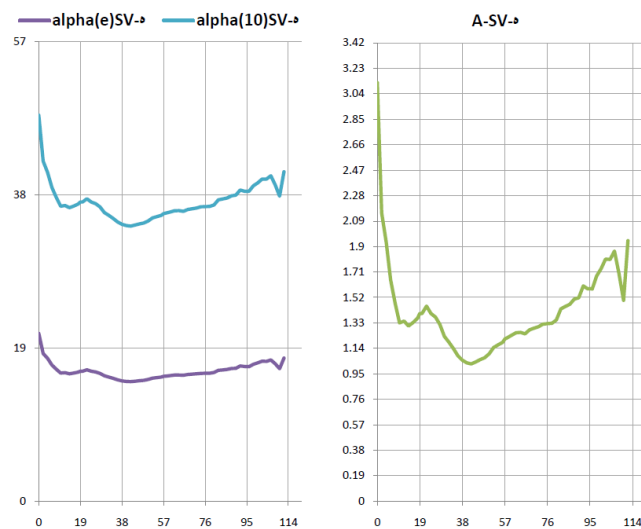


Figure 48. F-plots of the Sorted Variation of letter nun (ن) in Quran

Not seen from Table 5, $K(e)SV$ shows couplings exactly at $AM(0, 1.71)$, $(19, 0.95)$, and shows a minimum at $m(40, 0.817)$ with a termination at an absolute minimum $Am(112, 0.76)$.



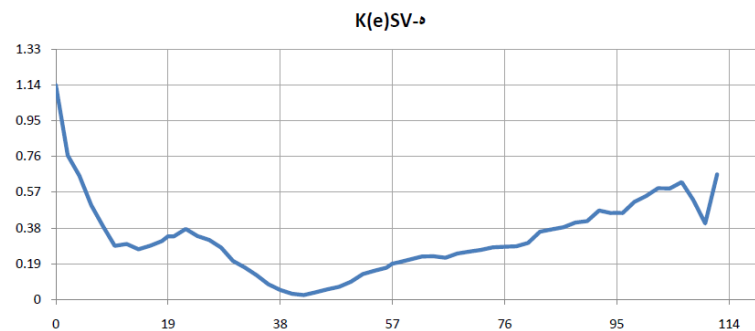


Figure 49. F-plots of the Sorted Variation of letter heh (ه) in Quran
Not seen from Table 5, K(e)SV shows couplings at AM(0, 1.14), a minimum at m(14, 0.266), a maximum at M(22, 0.38), and a central coupling at (57, 0.190).

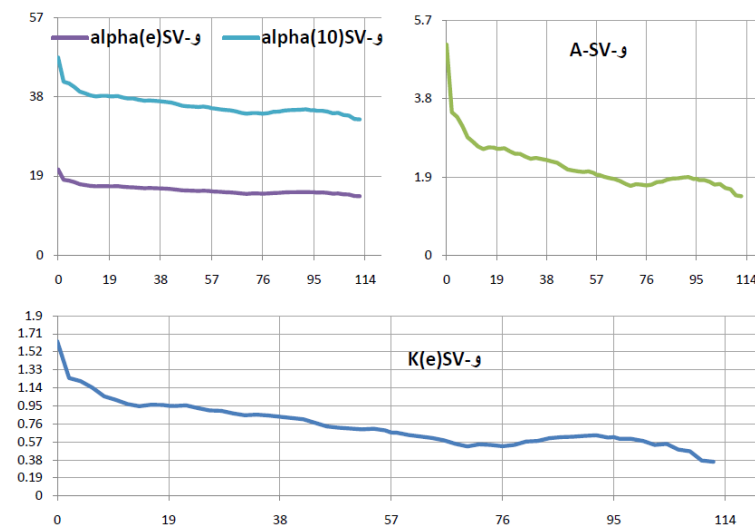


Figure 50. F-plots of the Sorted Variation of letter waw (و) in Quran
Not seen from Table 5, K(e)SV shows a CV(12-22, 0.95) which includes a coupling at (19, 0.95), and shows a termination at an absolute minimum Am(112, 0.38).

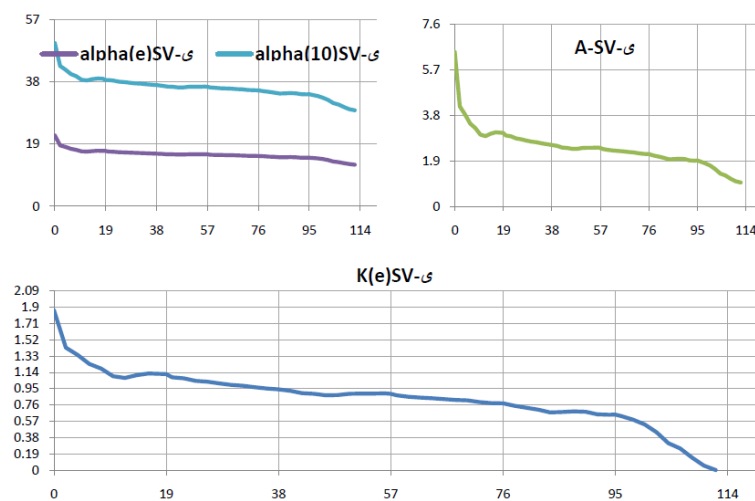


Figure 51. F-plots of the Sorted Variation of letter yeh (ي) in Quran
Not seen from Table 5, K(e)SV shows couplings at (19, 1.14), (38, 0.95), (76, 0.76), and a termination at an absolute minimum Am(112, 304E-5).

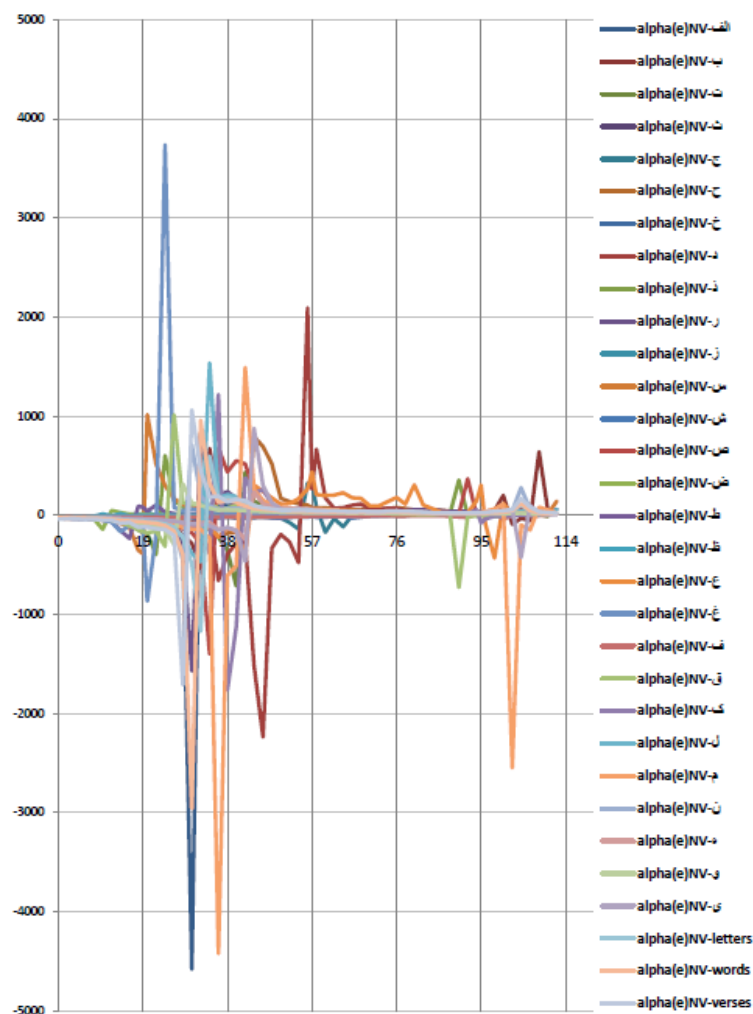


Figure 52. Simultaneous F-plots of all $\alpha(e)NV$ s computed for 31 specified Natural Variations in Quran. As a general characteristic, large amplitude negative-positive switching points are mainly observed to be located between $J=19$ and $J=57$ for these F-parameters. See the individual plots of these in the following Figures.

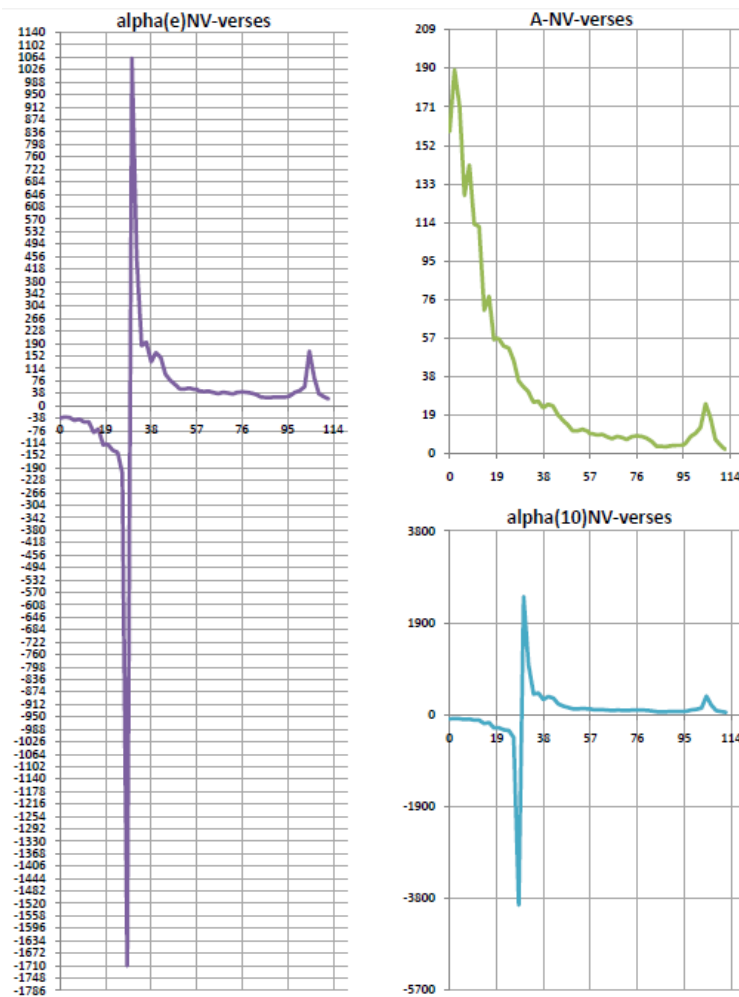
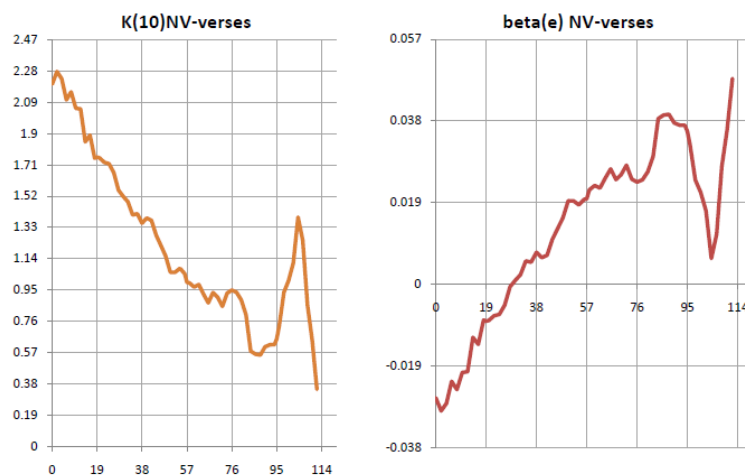


Figure 53. F-plots of the Natural Variation of verses in Quran

As can be seen from Table 6, $\alpha(e)$ starts at exactly (0, -38), nearly establishes a coupling at (19, -114), shows an exact value absolute minimum at $A_m(28, -1710)$, scores an absolute maximum at $J=30$ nearly at $MN(1064)$, and makes a coupling at (38, 133). Meantime, $\alpha(10)$ starts at (0, 87.4), makes a coupling at (19, -266) followed by an absolute minimum at $J=28$ at $MN(-38E+2)$, makes couplings at (57, 114), and (76, 95), and makes yet another coupling at (95, 64.6). The base-independent F-parameter A, makes an absolute maximum exactly at $AM(2, 190)$, followed by an exact coupling at (19, 57), followed by yet another coupling at (38, 22.8), and tops an exact 3-d MN maximum at $M(104, 24.7)$ prior to its termination at $J=112$.



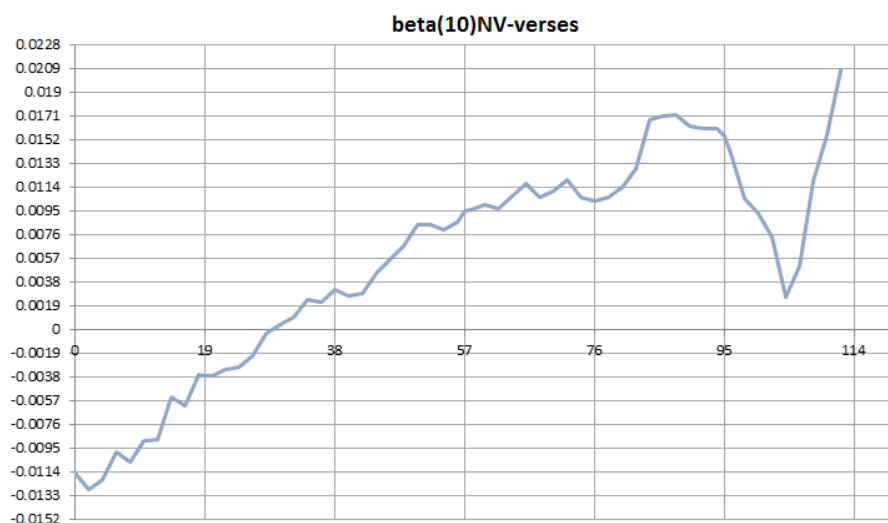
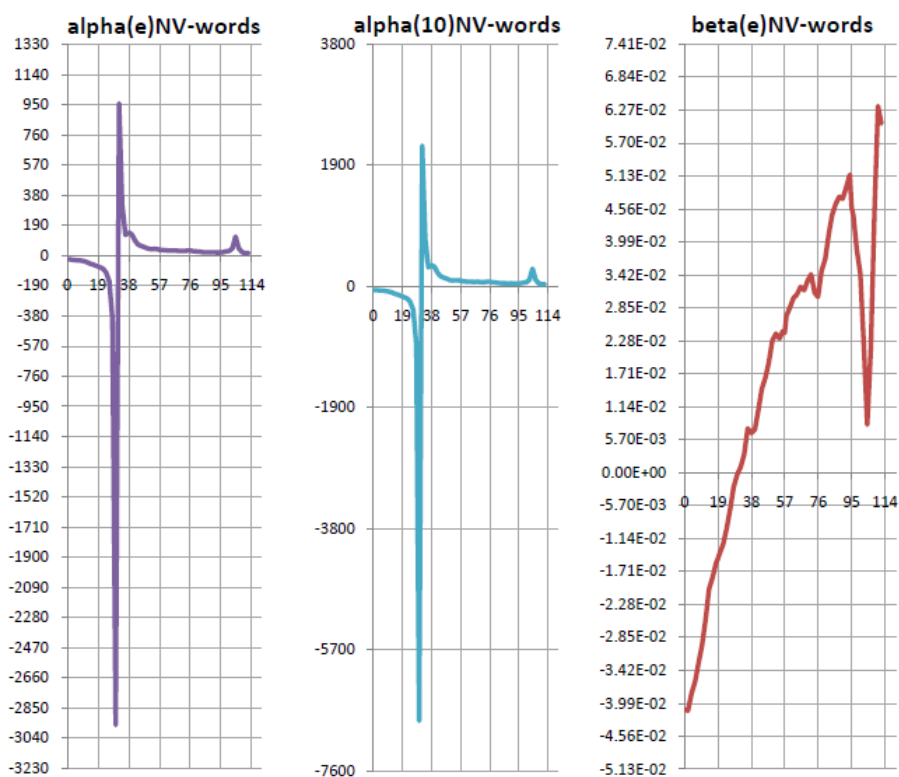


Figure 54. Continued F-plots of the Natural Variation of verses in Quran

Not seen from Table 6, K(10)-verses establishes an absolute maximum at AM(2, 2.28), makes a near coupling at (38, 1.33), continues to make a maximum and coupling at M(76, 0.95), makes a distinct 3-points CV minimum from J=84-88 at MN(0.57). Also, beta(10)NV-verses starts at exactly (0, -0.0114), establishes an exact coupling at (19, -0.0038), continues to make another exact coupling at (57, 0.095), makes a minimum at J=76 and tops an exact maximum at M(88, 0.0171), makes a near coupling at (95, 0.152), and terminates with an absolute 3-d/2-d maximum at AM(112, .0209/0.019). Not seen from the Figure, beta(e)-verses starts at (0, -0.0266), makes a coupling at (38, 0.076), makes another coupling at (57, 0.019), makes a distinct CV maximum at (84-94, 0.038), and shows a sharp minimum at nearly (104, 0.0057).



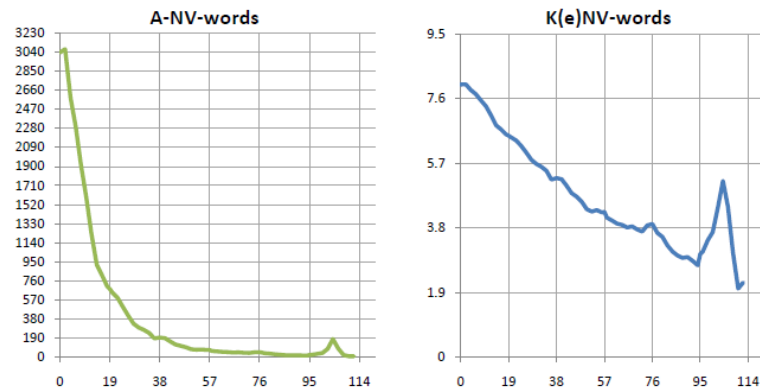


Figure 55. F-plots of the Natural Variation of words in Quran

Not seen from Table 6, K(e)NV shows couplings at (76, 3.8), (95, 3.04), and an absolute minimum at Am(110, 1.9). Meantime, beta(e)NV-words shows couplings at (38, 684E-5), minimum & coupling at m(76, 304E-4), coupling at (95, 456E-4), a near maximum and coupling is also observed at M(95, 513E-4).

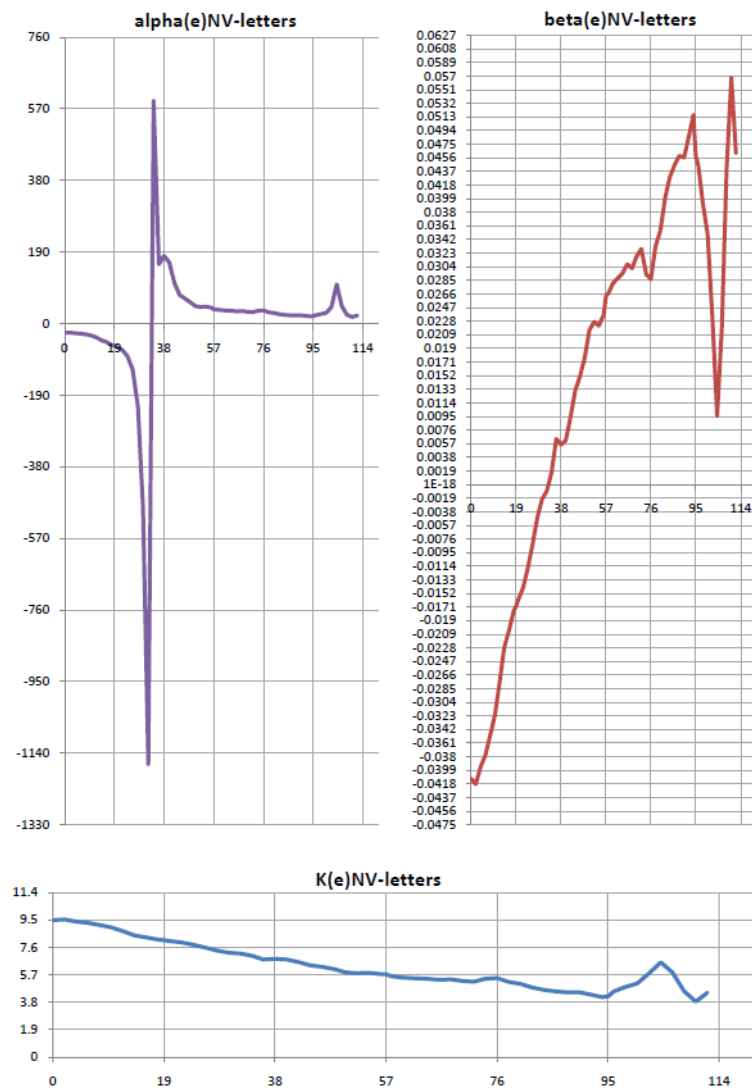


Figure 56. F-plots of the Natural Variation of (total) letters in Quran

Not seen from Table 6, K(e)NV-letters shows couplings and absolute maximum at AM(0-2, 9.5), central coupling at (57, 5.7), and an absolute minimum at Am(110, 3.8). Meantime, beta(e)NV-letters shows couplings at (2, -418E-4), (19, -171E-4), (38, 57E-4), (76, 285E-4), nearly a (95, 456E-4), a minimum at m(104, 95E-4), and an

absolute maximum at AM(110, 0.057).

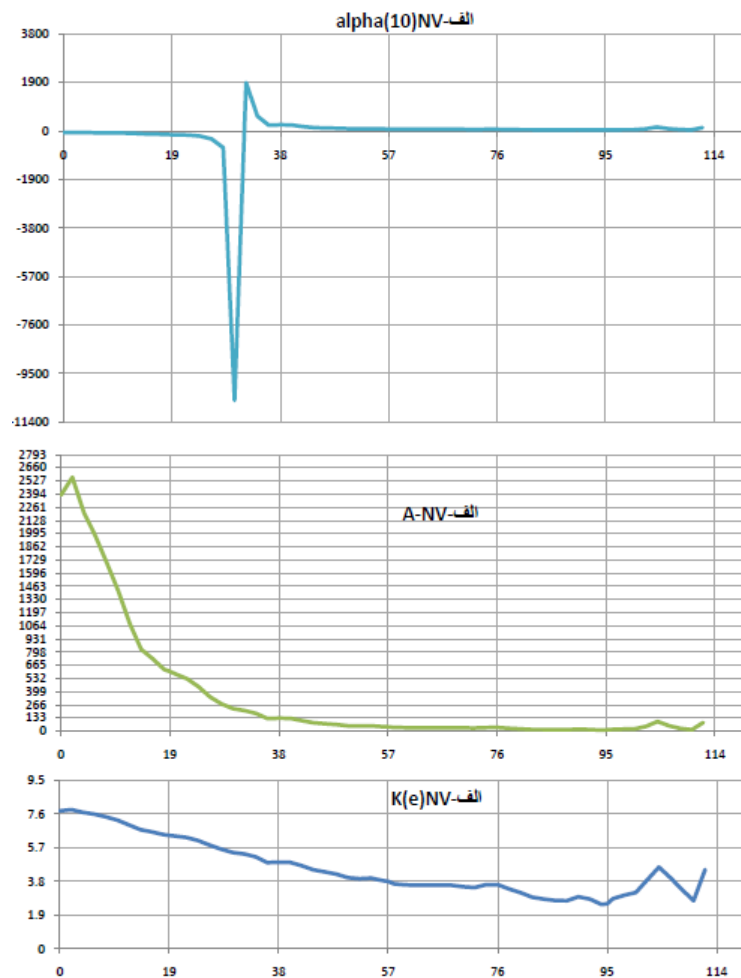


Figure 57. F-plots of the Natural Variation of letter alif (الف) in Quran

Alpha(10)NV-alif starts at (0, -57), makes a precise coupling at (19, -133), an absolute minimum precisely at Am(30, -19×555), continues with an absolute maximum at AM(32, 1900), and makes a coupling at (57, 76). See from Table 6, among other effects, that alpha(e)NV-alif makes a (19, -57) coupling followed by an absolute minimum precisely at Am(30, 19×241). Base-independent A-NV-alif makes an absolute maximum at 2565 or exactly at AM(2, 19×135) followed by an exact coupling at (38, 133), continues with yet another coupling at (76, 38) before a 3-d MN termination at (112, 87.4). Not seen from Table 6, K(e)NV-alif starts at (0, 7.6), makes an exact coupling at (57, 3.8), and makes a double 2-d/3-d coupling at (76, 38/36.1).

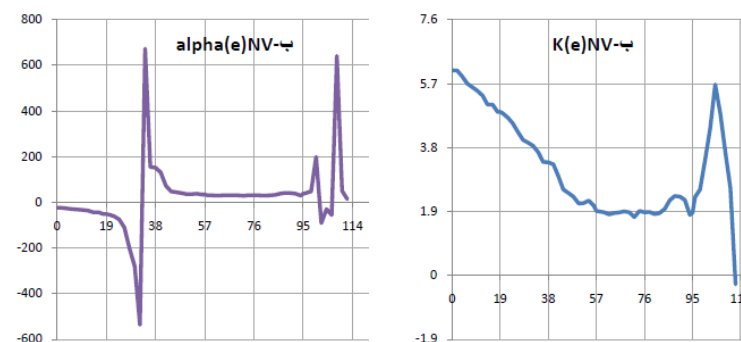


Figure 58. F-plots of the Natural Variation of letter beh (ب) in Quran

As seen from Table 6, starting from a 3-d coupling at (19, -51.3), alpha(e)NV-beh makes a second coupling precisely at (38, 152), followed by another precise 3-d coupling at (57, 34.2), and finally makes a 2-d coupling at

exactly (95, 38). Not seen from Table 6, K(e)NV-beh makes an exact central coupling at (57, 1.9), maintains a CV(57-84, 1.9), continues to make a minimum and coupling at m(95, 1.9), it then hits a distinct exact maximum at (104, 5.7) while terminating very nearly at (112, -0.266).

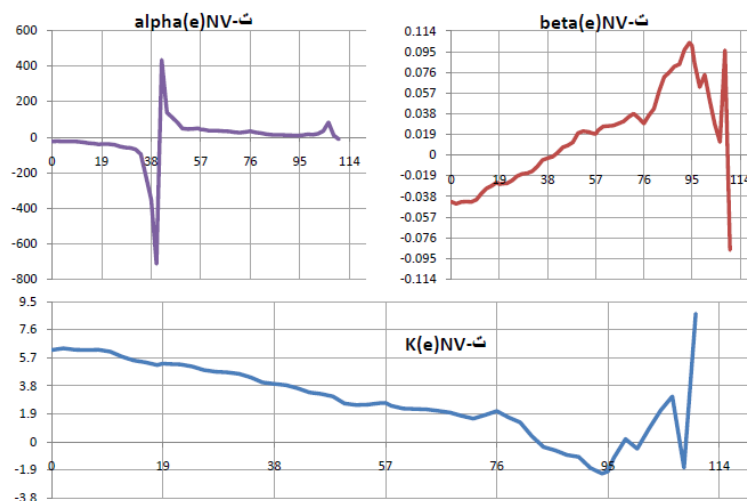


Figure 59. F-plots of the Natural Variation of letter teh (ت) in Quran

As can be seen from Table 6, $\alpha(e)NV-teh$ shows exact coupling at (19, -38), absolute maximum at AM(42, 19×23), exact coupling at (76, 43.2), exact 3-d MN value termination at (112, -11.4). Not seen from Table 6, $\beta(e)NV-teh$ shows couplings at (38, -0.00285), and (57, 0.019), a maximum at M(72, 0.038), a minimum at m(76, 0.029), and a maximum at M(108, 0.095). Also, not seen from Table 6, $K(e)NV-teh$ shows coupling at (38, 3.8), a double 3-d/2-d coupling and maximum at M(76, 2.09/1.9), a coupling at (95, -1.9), a maximum at M(98, 0.19), followed by a minimum observed at m(108, -1.9) just before termination at J=110.

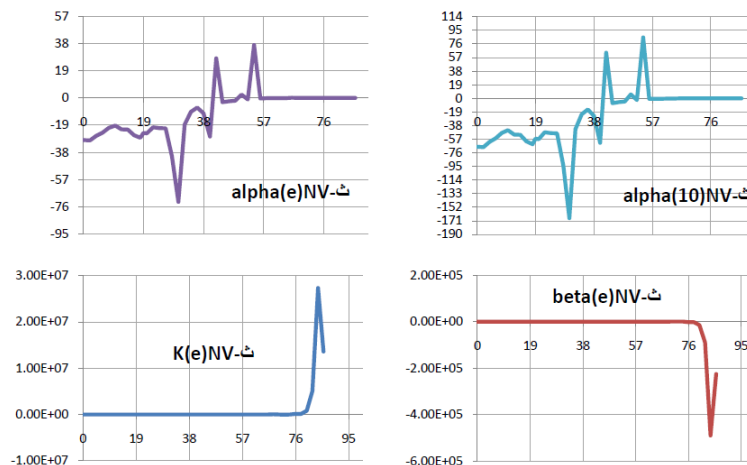


Figure 60. F-plots of the Natural Variation of letter theh (ث) in Quran

The prominent NBFS effect observed for $\alpha(e)NV-theh$ is the absolute maximum at AM(54, 38), following which it levels off at zero. Not seen from Table 6 and the F-plot (due to the order of magnitude difference), $K(e)NV-theh$ shows the following couplings and effects at (0, 3.8), m(19, 3.8), m(42, -0.19), M(48, 32.3), and a coupling at (57, 38E1). Meantime, $\beta(e)NV-theh$ starts at (0, -342E-4), and shows coupling and effects at (38, -95E-3), M(42, 361E-4), and M(50, 0.418).

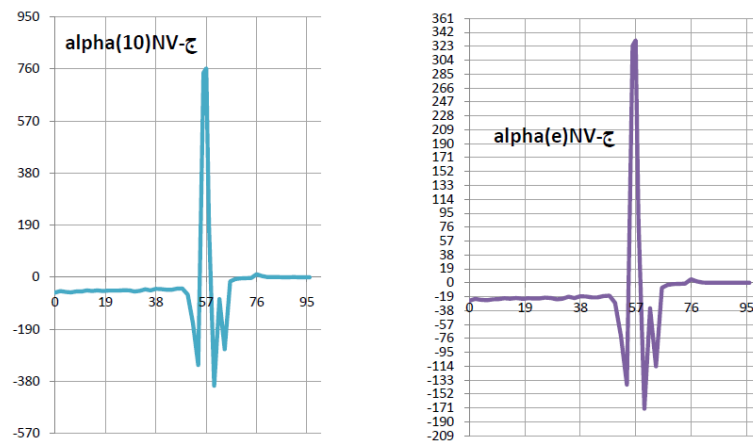


Figure 61 F-plots of the Natural Variation of letter jim (ج) in Quran

Main NBF effects are seen from Table 6, in particular notice the very exact absolute minima and maxima observed for both bases e and 10.

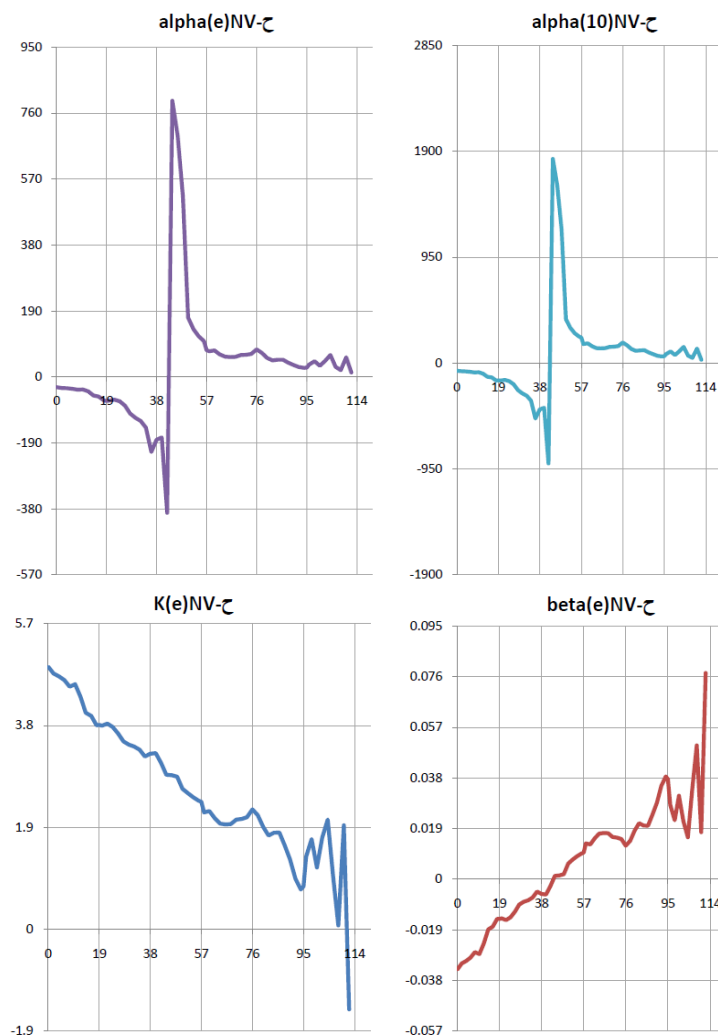


Figure 62. F-plots of the Natural Variation of letter ha (ح) in Quran

Not seen from Table 6, $K(e)NV$ -ha shows couplings and effects at (19, 3.8), $m(66, 1.9)$, $M(76, 2.23)$, and (95, 0.798). Also $\beta(e)NV$ -ha shows couplings and effects at (38, $-57E-4$), $M(66, 0.019)$, (95, 0.038), $m(76, 0.0125)$, and terminates at $AM(112, 0.076)$.

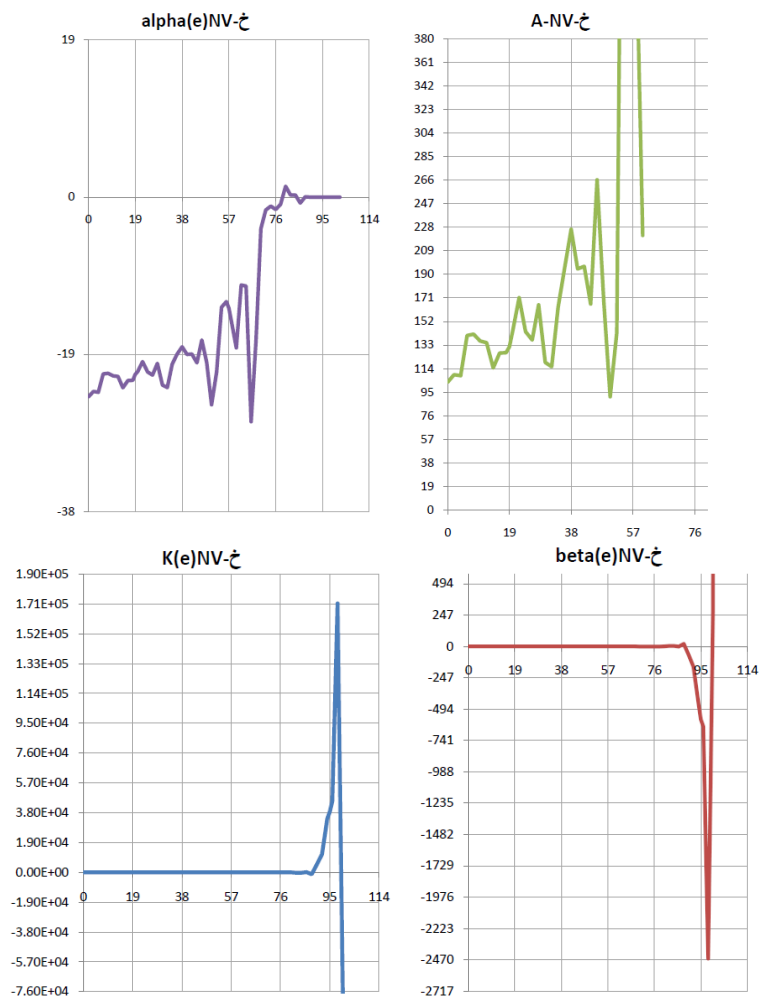
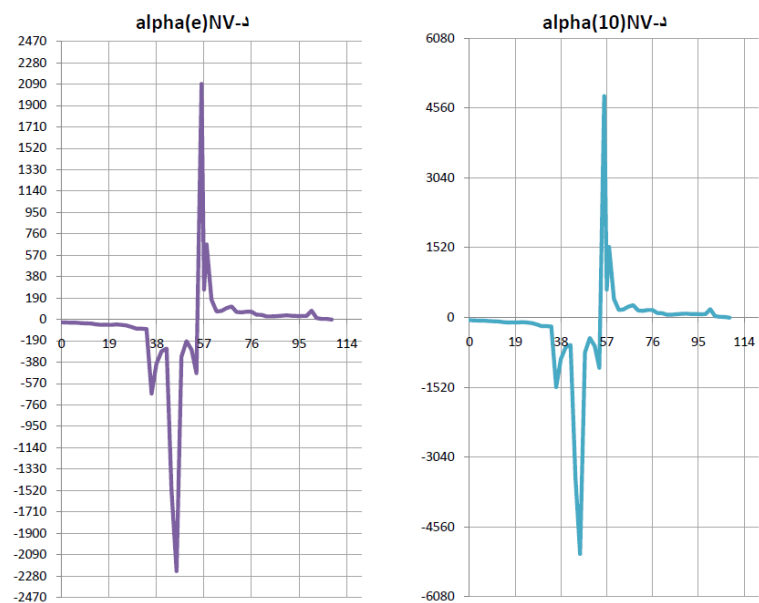


Figure 63. F-plots of the Natural Variation of letter kha (خ) in Quran

Not seen from Table 6, K(e)NV-kha shows couplings at (19, 4.94), (76, 43.7), a maximum at M(78, 76), and a coupling at (95, 38E3), followed by an absolute maximum exactly at AM(98, 171E3). Meantime, beta(e)NV-kha shows couplings at (19, 456E-4), (38, -57E-3), and (57, -76E-3), a minimum at m(78, -1.14), and an absolute minimum at Am(98, -247E1).



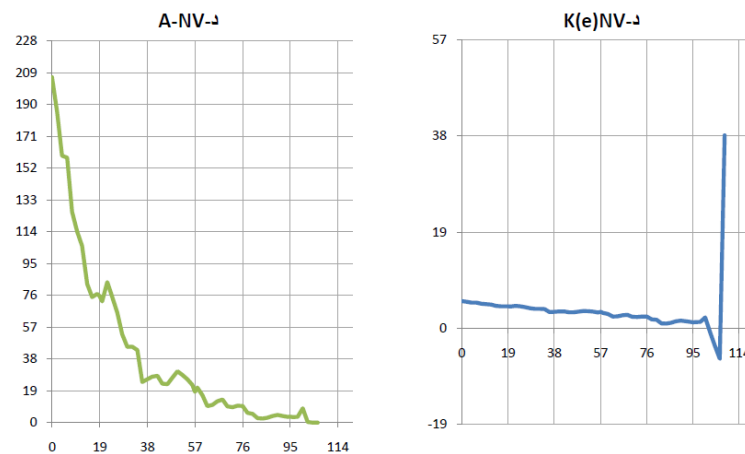


Figure 64. F-plots of the Natural Variation of letter dal (ﺩ) in Quran

Not seen from Table 6, K(e)NV-dal shows couplings at (0, 5.32), very nearly at (38, 3.23), exactly at (57, 3.23), at (76, 2.28), and at (95, 1.14), followed by an absolute maximum which is also a terminal point exactly at AM(108, 38).

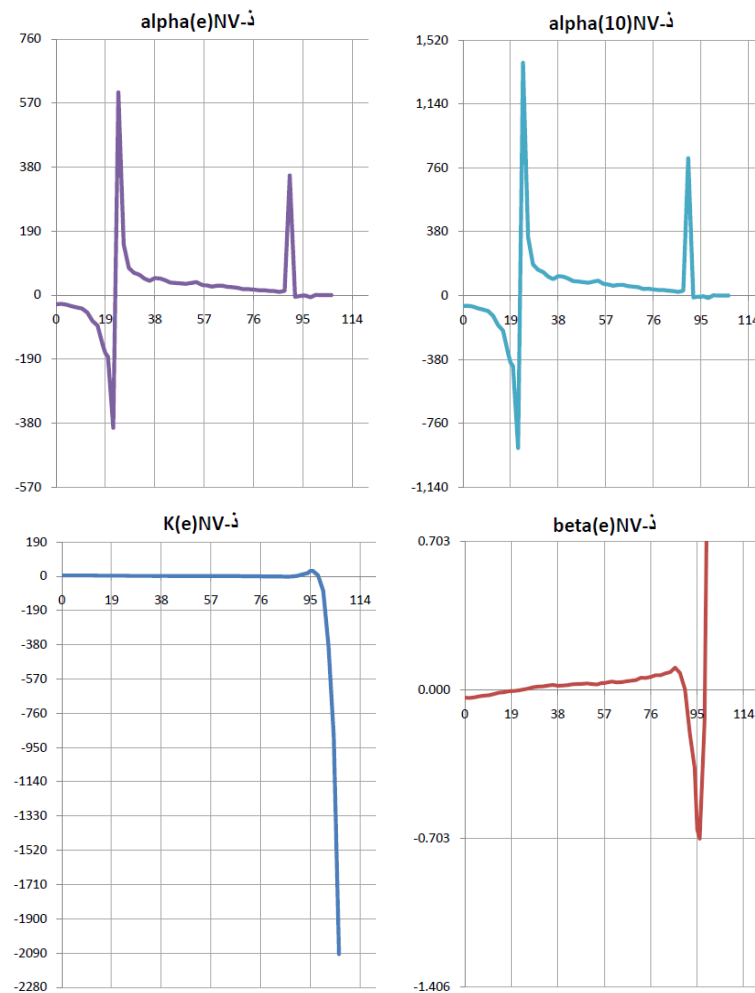


Figure 65. F-plots of the Natural Variation of letter dhal (ﺫ) in Quran

Not seen from Table 6, K(e)NV-dhal starts very nearly at (0, 5.13), shows couplings at (38, 1.9), (57, 0.988), and terminates exactly at Am(106, -209E1). Also, beta(e)NV-dhal shows couplings at (0, -0.038), (2, -0.038), (19, -57E-4), (38, 0.019), and (57, 323E-4) followed by an absolute minimum exactly at Am(96, -0.703).

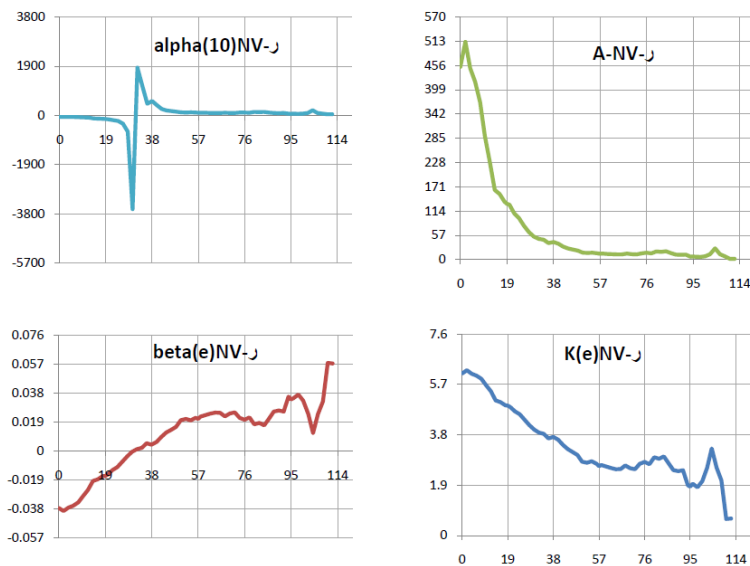


Figure 66. F-plots of the Natural Variation of letter ra (ر) in Quran

Not seen from Table 6, beta(e)NV-ra shows, starting and absolute minimum at Am(0-2, -0.038), couplings at (57, 0.0209), (76, 0.019), (95, 0.0342), and (95, 0.798), and a minimum at m(98, 0.038), and shows an absolute maximum at AM(110, 0.057), and a termination at (112, 0.057). Also, K(e)NV-ra shows couplings at (38, 3.8), and (95, 1.9), and terminates exactly at (112, 0.646).

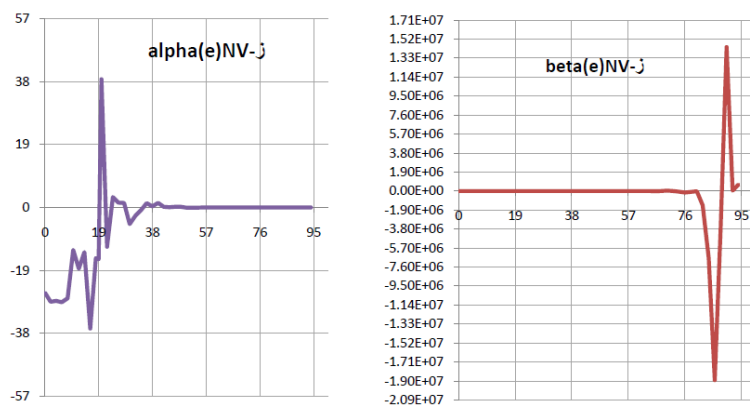


Figure 67. F-plots of the Natural Variation of letter zin (ز) in Quran

Observe the interesting absolute minimum maximum values for alpha(e)NV-zin at MN(± 38). Not seen from Table 6, beta(e)NV-zin shows (0, 0.038), (57, -19E1/-209), and an absolute minimum at Am(86, -190E5).

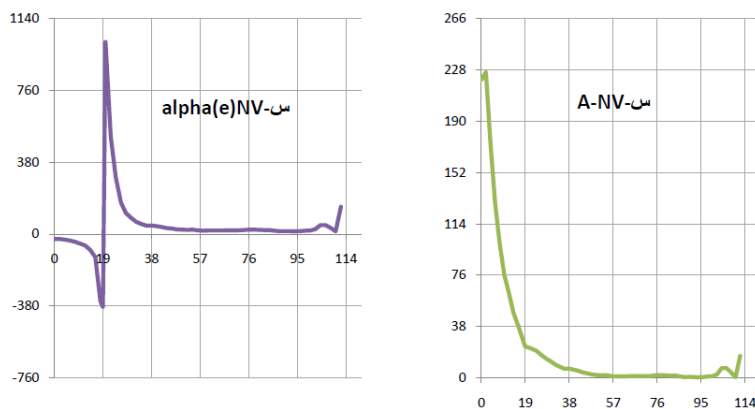


Figure 68. F-plots of the Natural Variation of letter sin (س) in Quran

See Table 6 for the details.

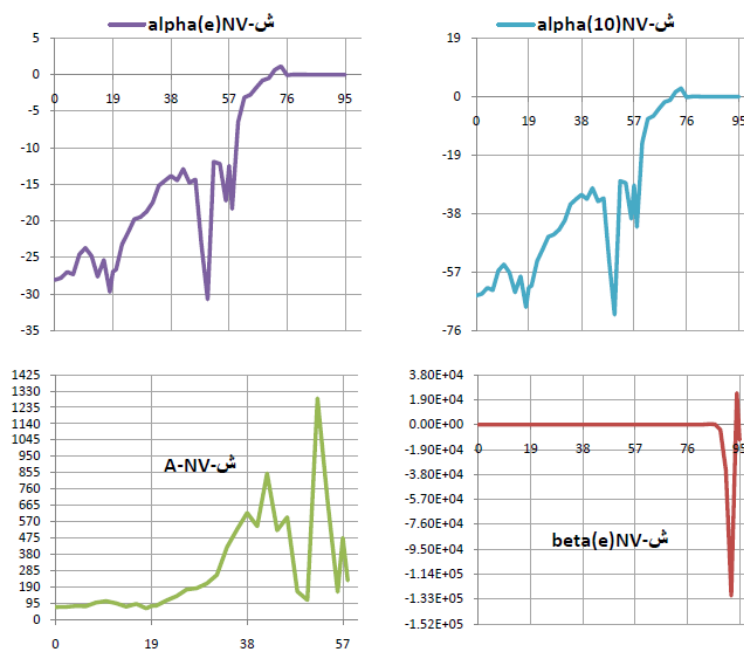


Figure 69. F-plots of the Natural Variation of letter shin (ش) in Quran
Not seen from Table 6, beta(e)NV-shin shows couplings at (19, -0.038), (38, -0.0722), and an absolute minimum at nearly Am(92, -133E3) followed by an absolute maximum exactly at AM(94, 19×1269).

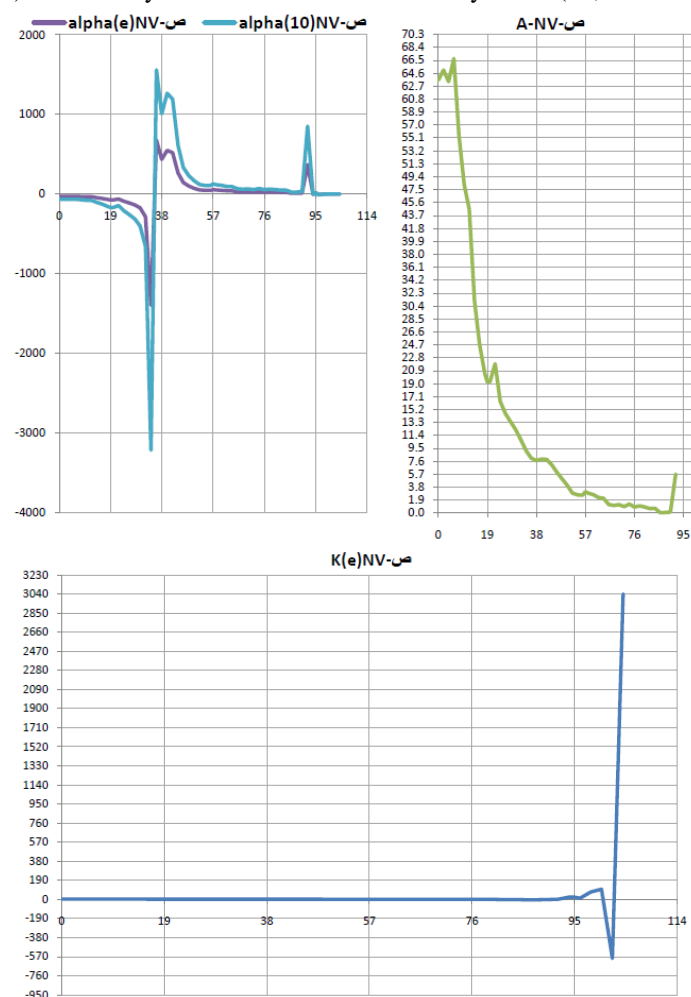


Figure 70. F-plots of the Natural Variation of letter sad (ص) in Quran

Not seen from Table 6, K(e)NV-sad shows couplings at (2, 4.18), (19, 3.04), (38, 1.9), (57, 1.14), and (95, 22.8), followed by an absolute minimum at Am(102, -57E1), and an absolute maximum at AM(104, 304E1).

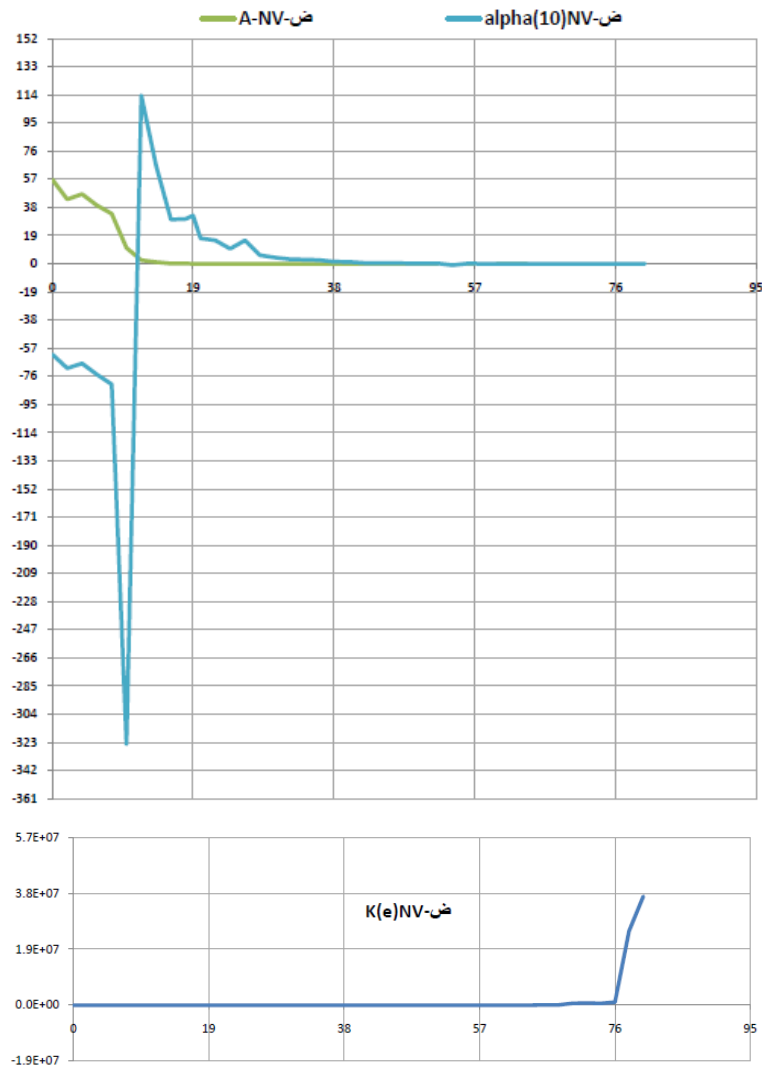
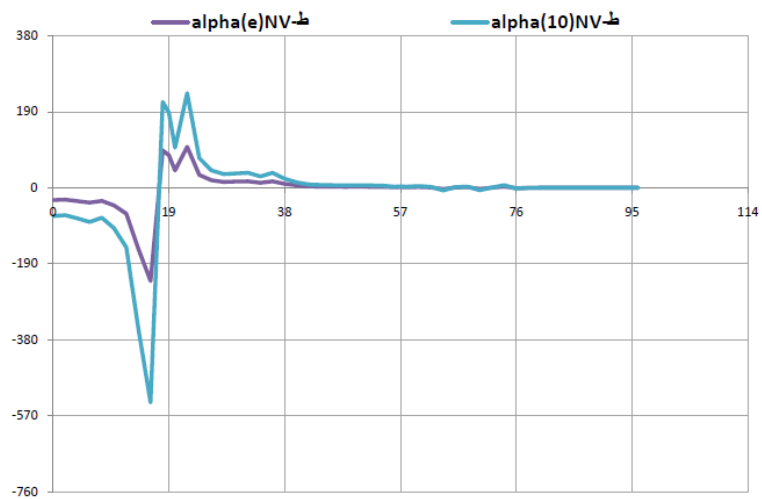


Figure 71. F-plots of the Natural Variation of letter dad (ظ) in Quran

Not seen from Table 6, k(e)NV-dad shows couplings at (2, 3.8), (19, 1.9), (38, -85.5), (57, 114E1), and an absolute maximum at AM(80, 38E6).



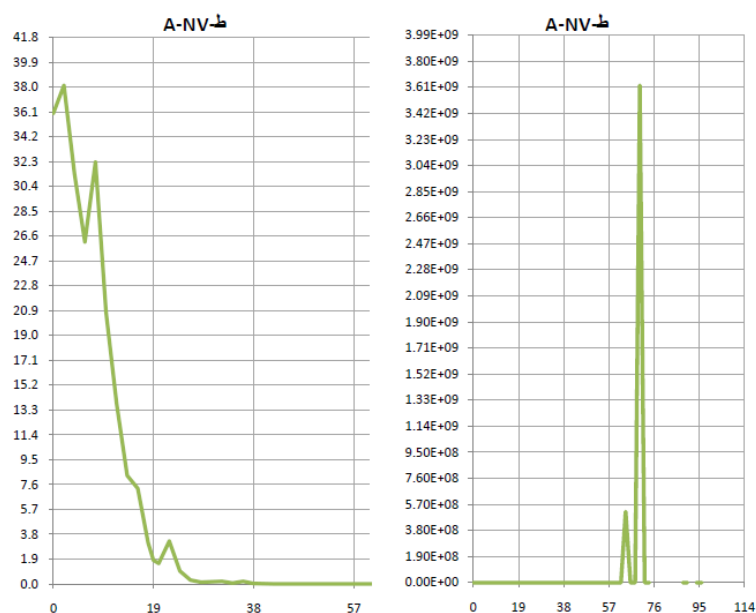


Figure 72. F-plots of the Natural Variation of letter ta (ط) in Quran
See Table 6 for the details.

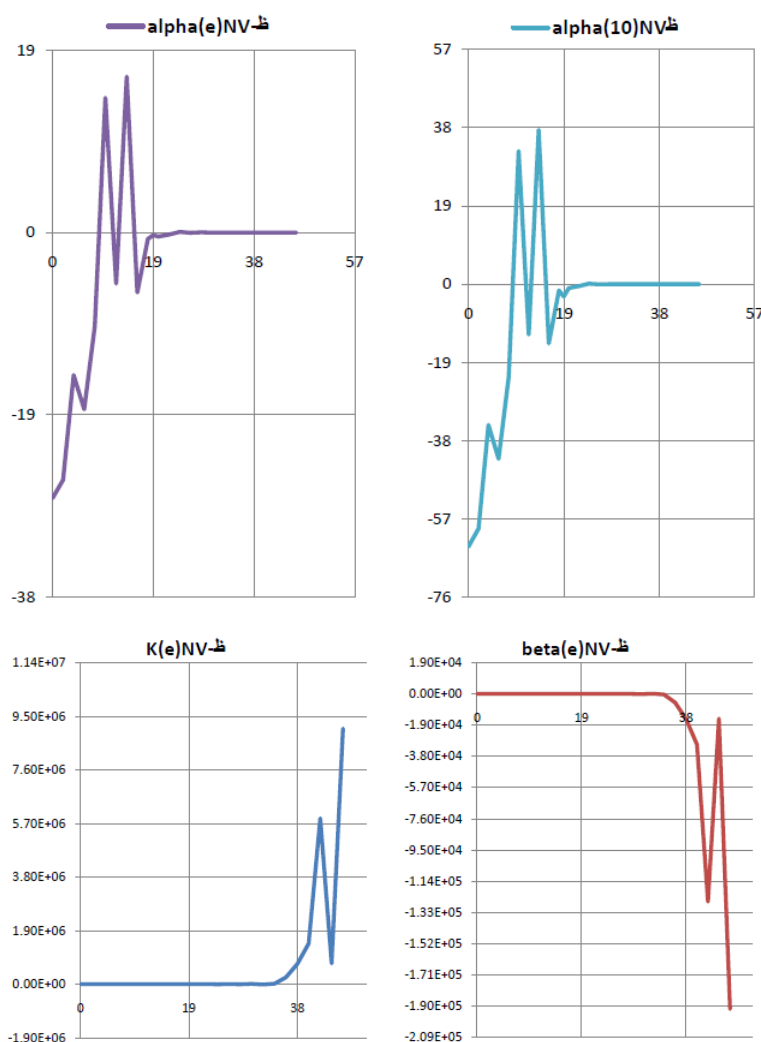


Figure 73. F-plots of the Natural Variation of letter dha (ظ) in Quran

Not seen from Table 6, K(e)NV-dha shows coupling and absolute minimum at Am(0, -0.038), an exact coupling and maximum at M(19, 171), a double 3-d/2-d maximum at M(42, 589E4/57E5), and a minimum at m(44, 76E4). Also, beta(e)NV-dha shows a double 3-d/2-d coupling at (0, -361E-4/-38E-3), couplings at (2, -0.038), (19, -0.76), (38, -152E-2), and both, an absolute minimum and a termination at Am(46, -190E3).

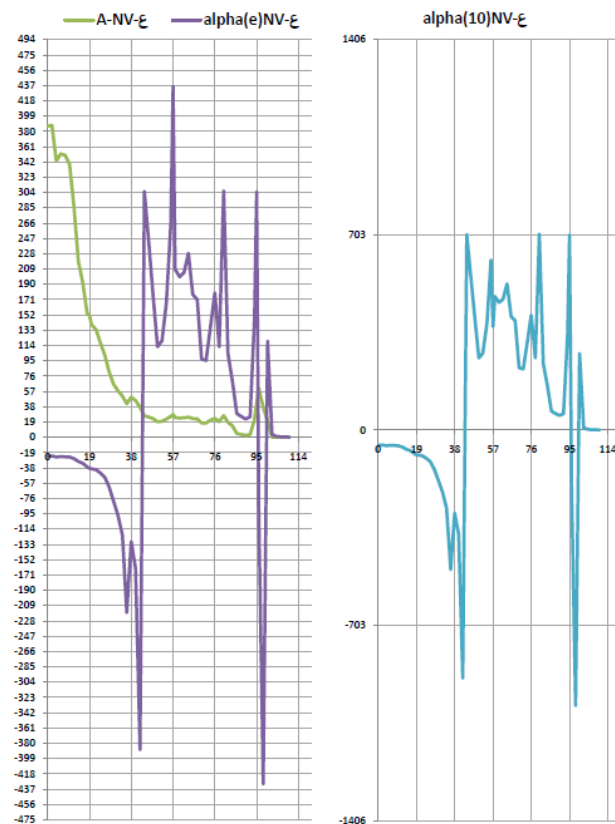
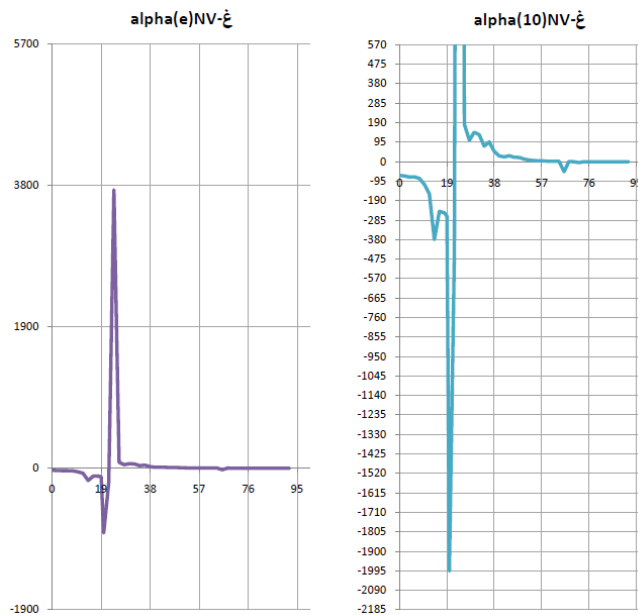


Figure 74. F-plots of the Natural Variation of letter ain (ξ) in Quran

Notice the interesting occurrence of the three alpha(e)NV-ain maxima at MN(304), and the same peaks for alpha(10)NV-ain at MN(703). Notice that the absolute alpha(e)NV maximum and coupling at AM(57, 437) has been computed with the sine term at J=57, while its minimum value for the alpha(10)NV at m(57, 38E1) has been computed with the cosine term at J=57 in the regression equation. See other couplings and effects from Table 6.



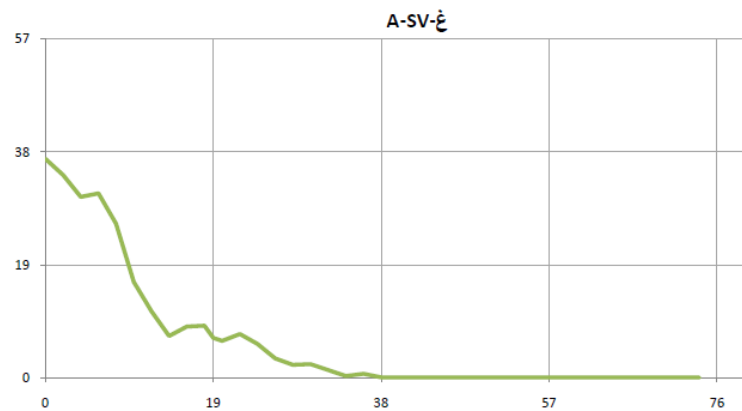


Figure 75. F-plots of the Natural Variation of letter ghain (غ) in Quran
See Table 6 for the details.

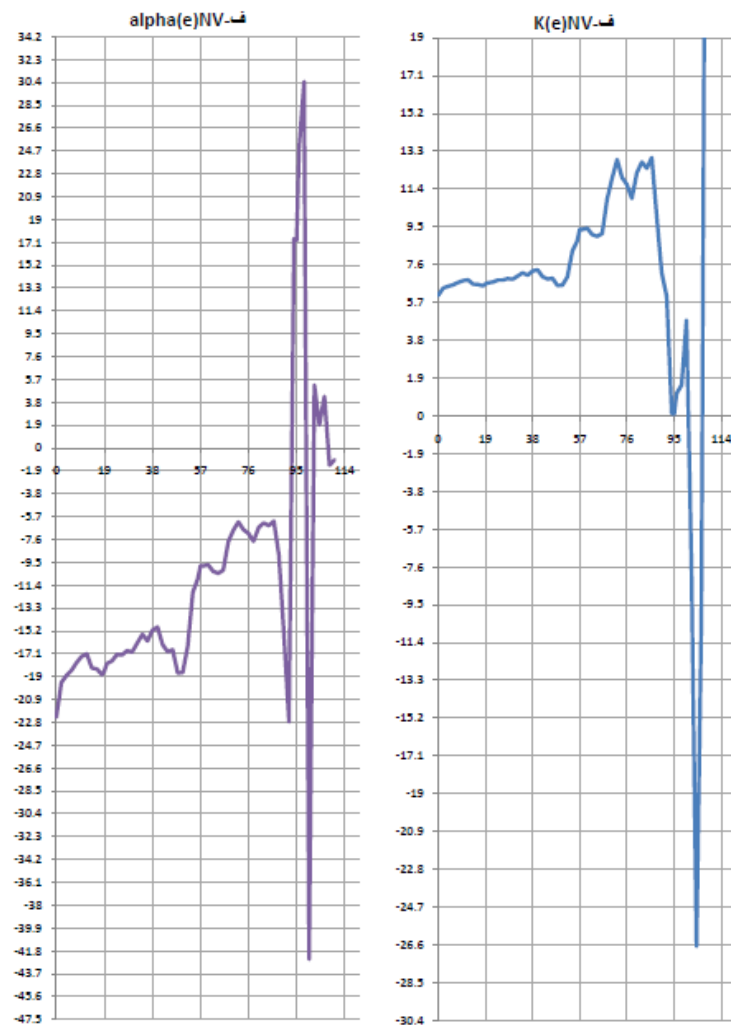


Figure 76. F-plots of the Natural Variation of letter feh (ف) in Quran

Not seen from Table 6, K(e)NV-feh shows maximum at M(12, 6.84), coupling at nearly (19, 6.65), a simultaneous coupling and maximum at M(57, 9.5), coupling at (76, 11.4), an exact coupling at (95, 893E-4), and a very sharp absolute minimum exactly at Am(104, -26.6).

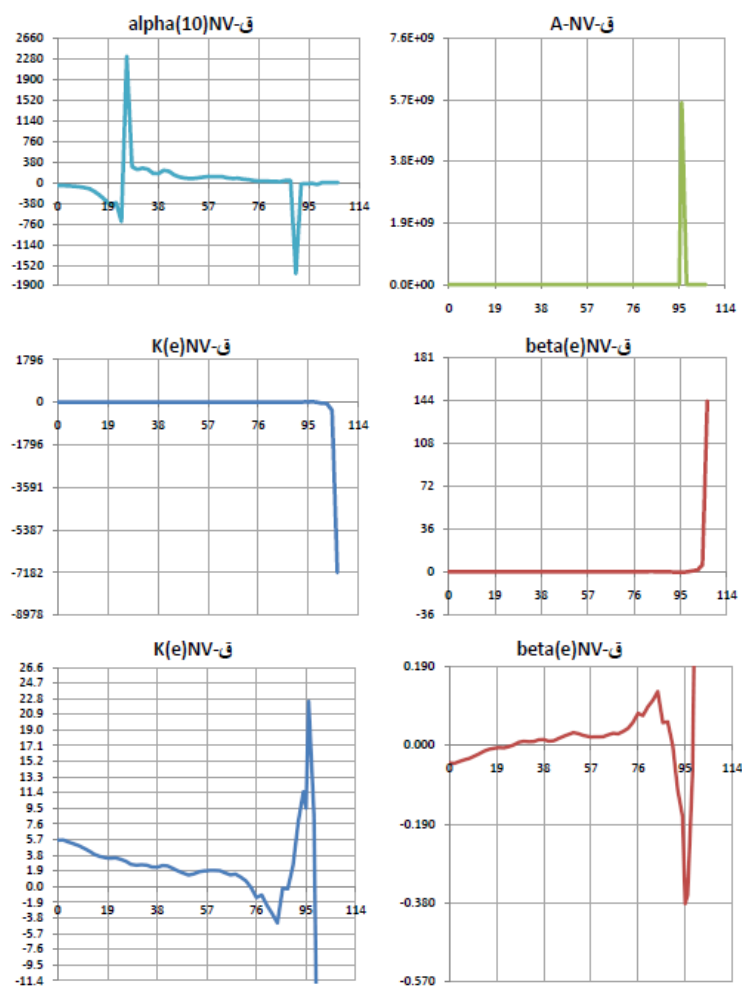


Figure 77. F-plots of the Natural Variation of letter qaf (ق) in Quran

Not seen from Table 6, K(e)NV-qaf shows couplings at (0-2, 5.7), (57, 1.9), and an exact (76, 1.33), a minimum nearly at m(84, -4.37), a maximum exactly at M(94, 11.4), followed by another exact coupling and minimum at m(95, 9.5), followed by an absolute minimum termination exactly at Am(106, 19×378). Meantime, K(e)NV-qaf shows couplings at (19, -608E-5), (57, 0.019), and (76, 0.076), and a sharp absolute minimum at Am(95, -0.38) followed by an absolute maximum and termination at Am(106, 144.4), where 1444=19×19×4.

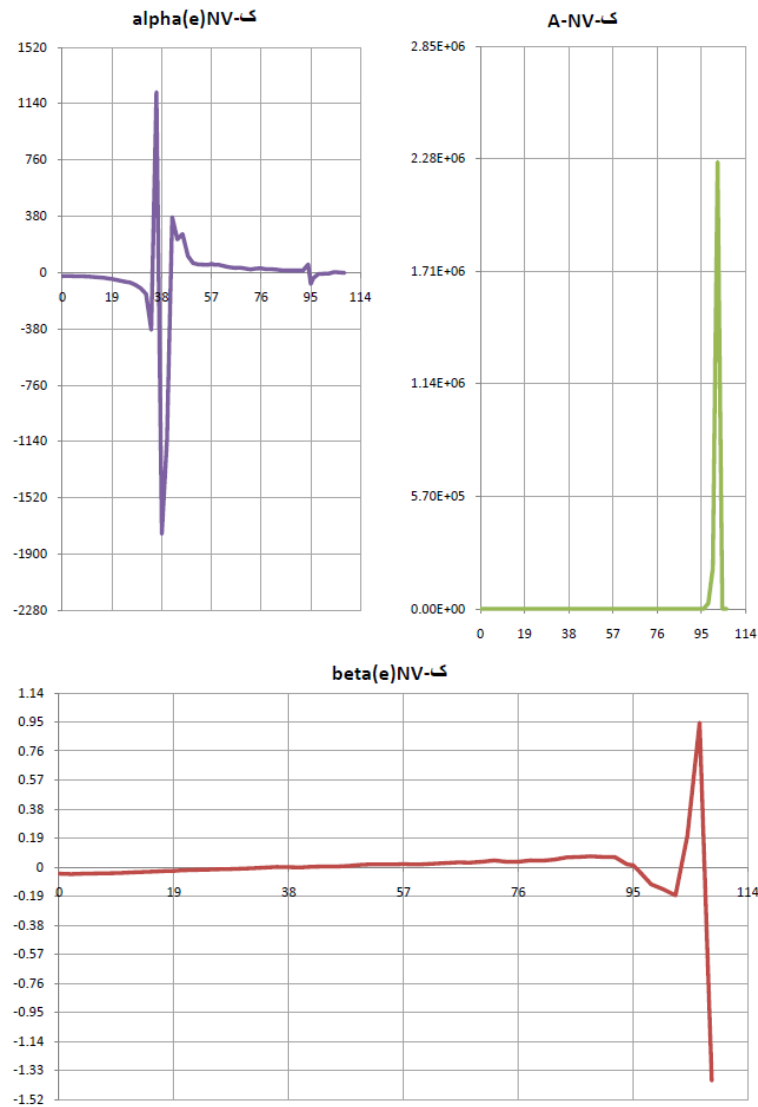
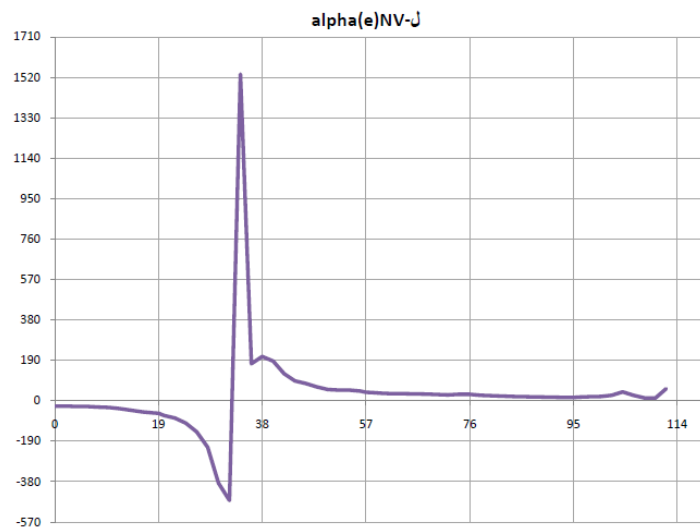


Figure 78. F-plots of the Natural Variation of letter kaf (ك) in Quran

Not seen from Table 6, beta(e)NV-kaf shows couplings at (2, -456E-4), (38, 57E-5), (57, 0.019), and (95, 133E-4), also a distinct minimum is observed at m(102, -0.19), and an absolute sharp maximum is seen at AM(106, 0.95).



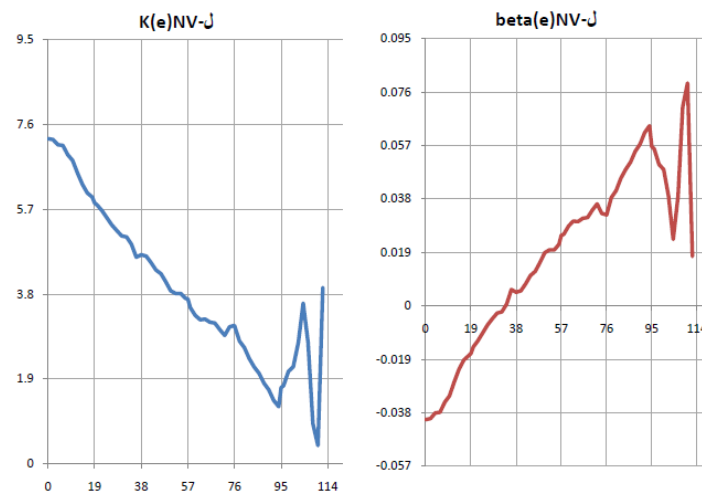


Figure 79. F-plots of the Natural Variation of letter lam (ل) in Quran

Not seen from Table 6, $K(e)NV$ -lam shows couplings at (19, 5.7), (57, 3.8), and (95, 1.71), a maximum at $M(104, 0.361)$, a minimum at $m(110, 0.38)$, and a termination at (112, 3.8). Minor maxima at $J=38$ and $J=76$ are also notable for $K(e)NV$. Meantime, $\beta(e)NV$ -lam shows couplings at (0-2, -0.038), (19, -0.0171), (76, 323E-4), and (95, 0.057), followed by a termination at (112, 0.019).

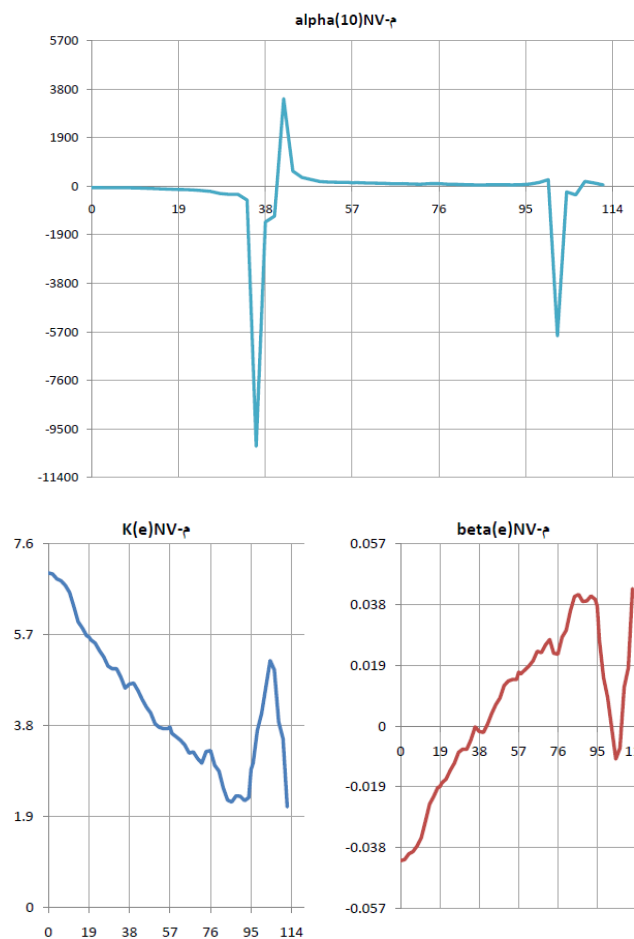


Figure 80. F-plots of the Natural Variation of letter mim (م) in Quran

Not seen from Table 6, $K(e)NV$ -mim shows couplings at (19, 5.7), (57, 3.8), a maximum at $M(76, 3.28)$, a near coupling at (95, 2.85), and a termination exactly at (112, 2.09). Also, $\beta(e)NV$ -mim shows, couplings exactly at (2, 0.0418), exactly at (19, -0.019), and a minimum and a near coupling at $m(76, 228E-4)$.

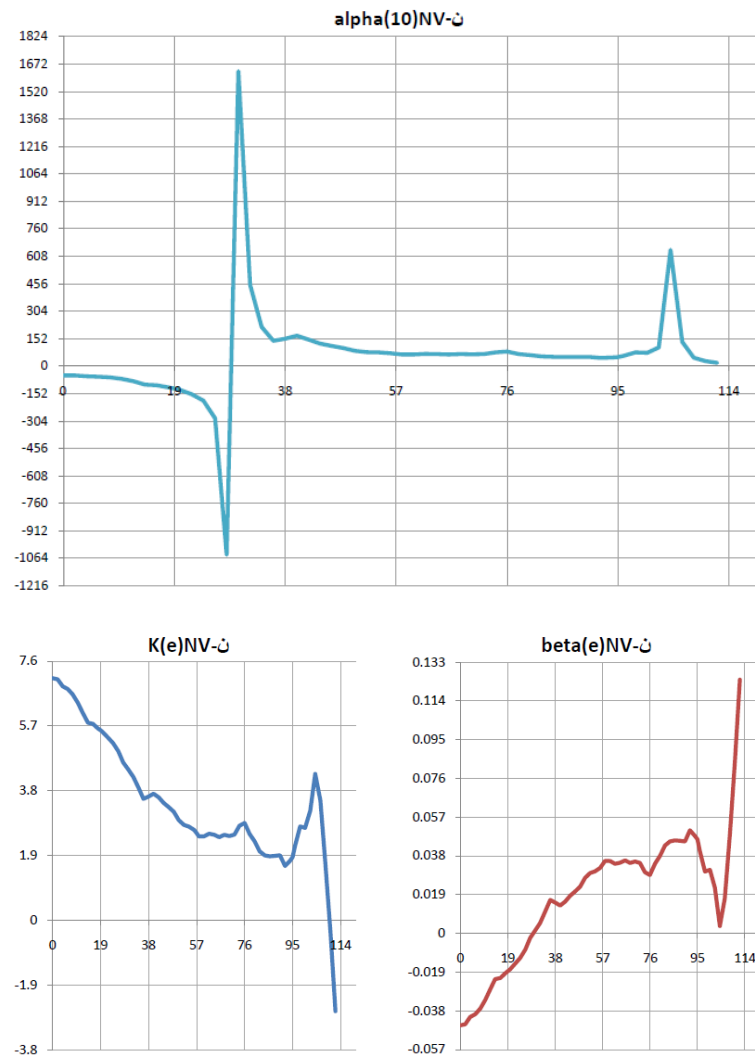


Figure 81. F-plots of the Natural Variation of letter nun (ن) in Quran

Not seen from Table 6, $K(e)NV$ -nun shows couplings at (19, 5.7), (38, 3.8), (76, 2.85), and (95, 1.9), and a termination at (112, -2.66). Meantime, $\beta(e)NV$ -nun shows couplings at (19, -0.019), (38, 0.0152), and (76, 0.0285).

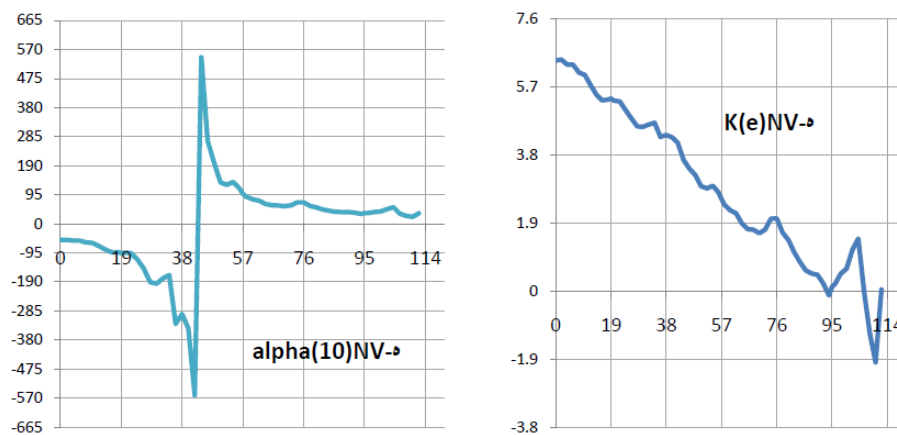


Figure 82. F-plots of the Natural Variation of letter heh (ه) in Quran

Not seen from Table 6, $K(e)NV$ -heh shows couplings exactly at (2, 6.46), (38, 4.37), (76, 1.9), (95, 1.9), and an absolute minimum at $Am(110, -1.9)$ with a termination nearly at (112, 0.0456).

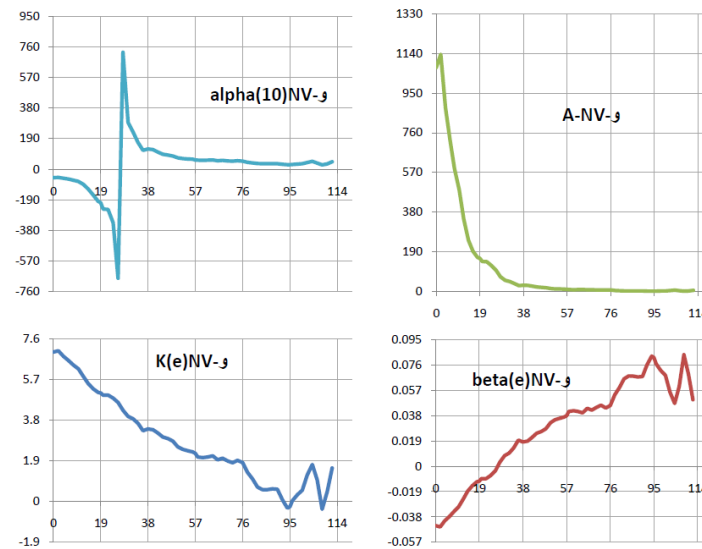


Figure 83. F-plots of the Natural Variation of letter waw (و) in Quran

Not seen from Table 6, K(e)NV-waw shows coupling at an exact (2, 7.03), a CV(62-76, 1.9), coupling at (76, 1.9), a maximum exactly at M(104, 1.71), and an absolute minimum at an exact Am(108, -0.38). Also, beta(e)NV-waw shows, couplings at (38, 0.019), exactly at (57, 0.038), exactly at (76, 0.0456), and exactly at (95, 0.0817), and eventually shows an absolute maximum at AM(108, 836E-4).

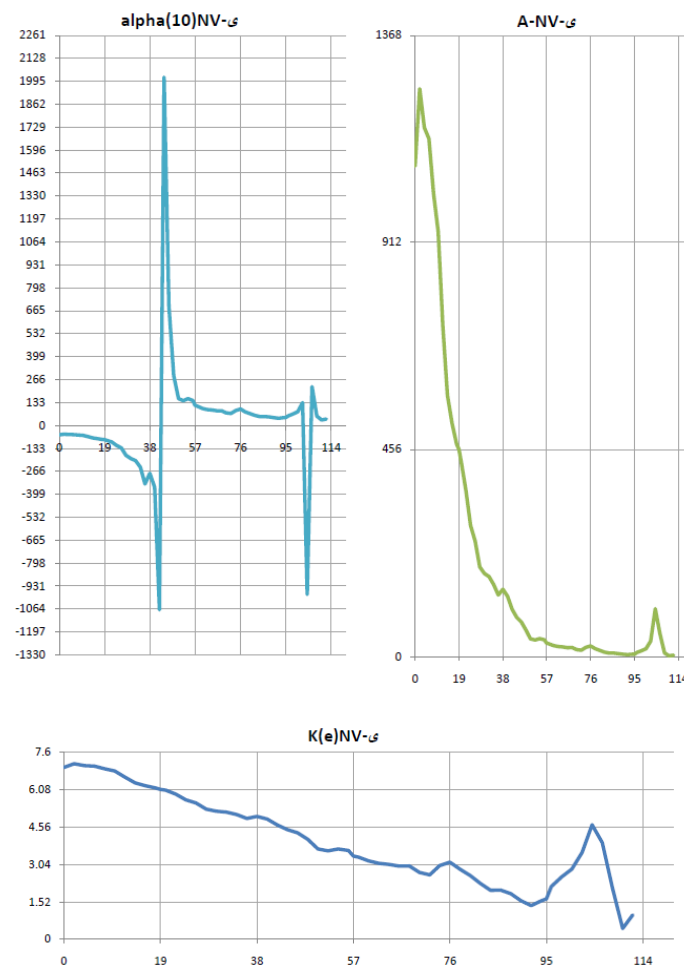


Figure 84. F-plots of the Natural Variation of letter yeh (ي) in Quran

Notice a very exact coupling at (19, 456) for A-NV, (see Table 6). Not seen from Table 6, K(e)NV-yeh shows a coupling exactly at (19, 6.08), a maximum at (76, 3.13), an absolute minimum exactly at Am(110, 0.437), and a termination point at J=112 with an exact value MN(0.988).

10. Sensitivity Tests of the Observed NBFS Couplings and Effects in Quran

So far in this article numerous NBFS couplings and effects have been observed both for the Sorted and for the Natural Variations in Quran. It is now interesting to see how sensitive these NBFS effects and manifestations are to the changes deliberately induced in Quran. We will do systematic tests of sensitivities, just as we did in the previous cases for the graphical observations.

10.1 Subtraction/Addition Tests of Sensitivity

Figures 85-88, show how slight manipulations in the chapter frequencies can completely demolish the NBFS couplings and effects initially observed for the Sorted Variations in Quran. It is seen that in general, addition or subtraction of every one character for those SVs which do not have zeros in them, will result in an upward or downward parallel translation of the computed F-parameter as can be seen from Figures 80-87. For those Variations, which have zero values in them, the results can be completely different and drastic changes can occur as can be seen from Figure 88. Since there are 62 variations and since enormously large number of possibilities for change can exist, we have only examined a few cases as examples for the rest. Notice also that any change in the Sorted Variation of a character will automatically affect the Natural Variation of that character as well.

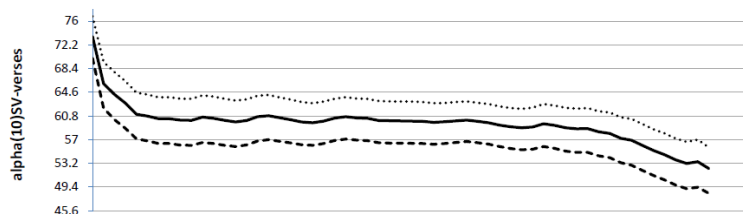
10.2 Permutation Tests of Sensitivity

As for the Natural Variations, consider that since chapters of Quran, as far as their subjects are concerned are almost independent of one another, it was possible to have Quran with altered chapter positions. In fact there can be an absolutely gigantic number of ($114!$ or almost 10^{186}) different possible chapter arrangements or NVs that can be permutation tested for their NBFS effects. Figures 89 and 90 show just two examples for what can happen when orders of only two chapters in Quran are altered. Notice though, that when positions of two chapters are switched, 31 NVs of all characters are affected, not just one NV. This was not the case for manipulations in the SVs which affect only the NBF regulation of the manipulated character, leaving other SVs unchanged. It is also clear that alteration of chapter positions although affects the NBF regulations observed for all NVs, will induce no change in the observed NBF effects of the SVs, simply because the sorted order is independent of the initial order of chapters.

10.3 Multiplication Tests of Sensitivity

Consider first that multiplication of any of the PVs by a constant factor, because of the method of computing the least squares, will only multiply the K constant by the same factor. In other words, if we multiply a variation by a constant C, all parameters will compute the same as before except K and A ($K \rightarrow CK$, and A will change accordingly). The problem is though, that words and alphabetic characters are quantized, in other words, we cannot have fractional letters or words or verses. This means that we will have to round up or round down, the frequencies after multiplication by a constant so that they become integers. In addition to that, in many small size chapters frequencies are zero for certain characters which when multiplied by any constant will yield zero again. So in effect, such multiplications of the PVs by a constant C will produce non proportional quantized changes in the variations' frequencies which will therefore induce changes in computation of not only K and A, but all other F-parameters as well. So, the least that we can expect by such multiplications is that computed NBFS effects for A and K will change and depending on the case at hand we should also expect to see drastic changes in computation of other F-parameters as well.

In the following figures we will show some of the selected Principle Variations in Quran and will show the effects of mentioned sensitivity tests on them. Explanations are given in figure captions.



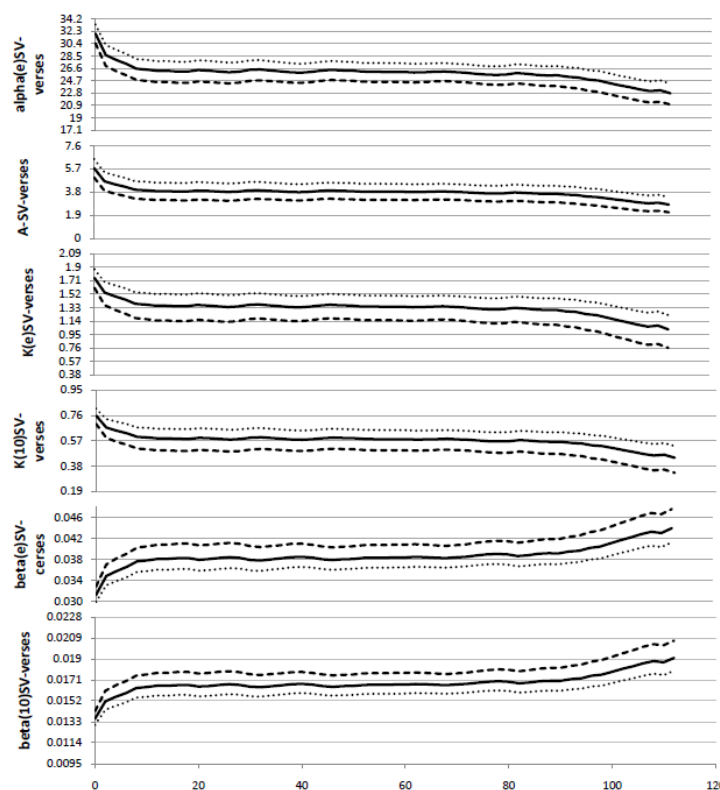


Figure 85. Subtraction/Addition sensitivity tests of the NBFS effects for the Sorted Variation of verses in Quran. The F-parameters computed for real Quran are shown in full black lines, those computed for the case with only one verse added to each chapter are shown in dotted lines, and those computed for the case with only one verse subtracted from each chapter are shown by dashed lines. Notice complete demolition of the NBFS effects in manipulated Qurans, particularly for $\beta(e)$, $\beta(10)$, $K(10)$, and A-SV.

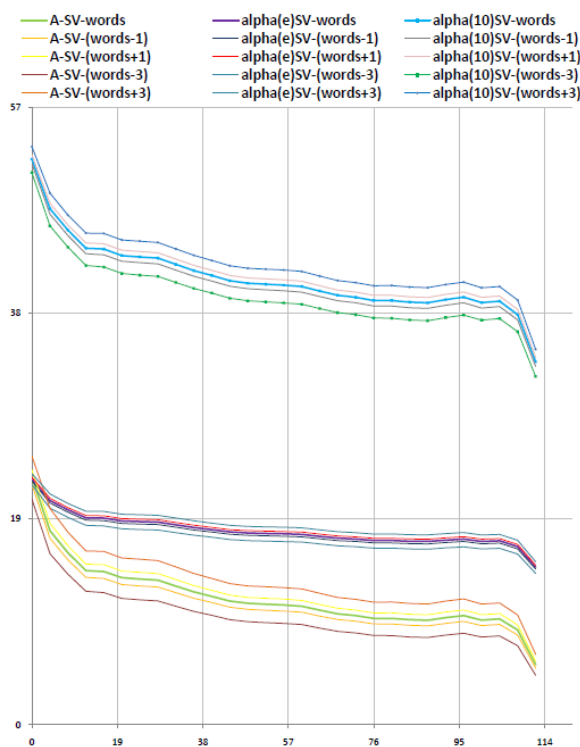


Figure 86. Subtraction/Addition sensitivity tests of the F-parameters conducted for the Sorted Variation of words in Quran as ± 1 , and ± 3 words are added to each chapter in Quran.

Notice the general, almost equal amount, parallel translations up and down per word added or subtracted. In particular, notice the very interesting effect (see Figure 21), that the common starting point for A-SV and $\alpha(e)SV$ which is observed for real Quran at (0, 22.8), vanishes in all cases as words have been added or subtracted in manipulated Qurans. The Fundamental (19, 19) coupling for $\alpha(e)SV$ -words is also vanished after ± 3 or more letters are added to each chapter.(only $J=0, 4, 8, 12, \dots$ have been used for these tests).

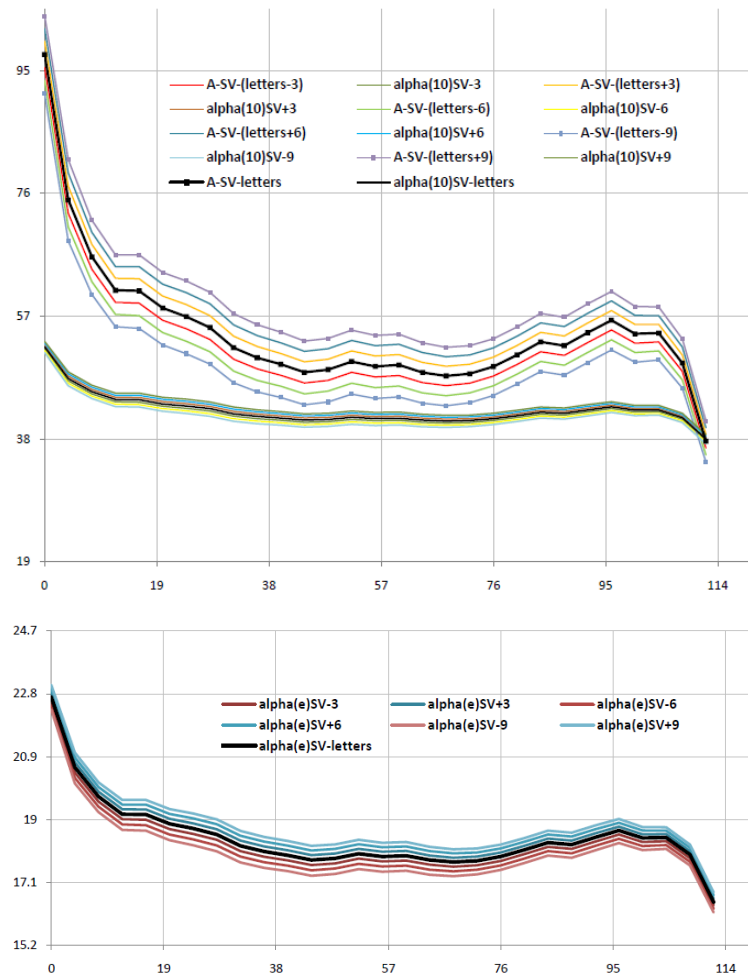


Figure 87. Subtraction/Addition sensitivity test of F-parameters conducted for the Sorted Variation of letters in Quran as ± 3 , ± 6 , and ± 9 letters are added to each chapter in real Quran

Notice the general, almost equal amount parallel translations, up and down per unit letter added or subtracted, similar to the word case. In particular, notice the very interesting effect (see Figure 22) that the common meeting point for A and $\alpha(10)$ in the top figure, which for real Quran (plotted in black) is observed exactly at the terminal point (112, 38), is destroyed in all cases as letters have been added or subtracted in manipulated Qurans. The Fundamental (19, 19) coupling for $\alpha(e)SV$ -letters is also seen to have vanished after ± 9 or more letters are added to each chapter (only $J=0, 4, 8, 12, \dots$ have been used for these tests).

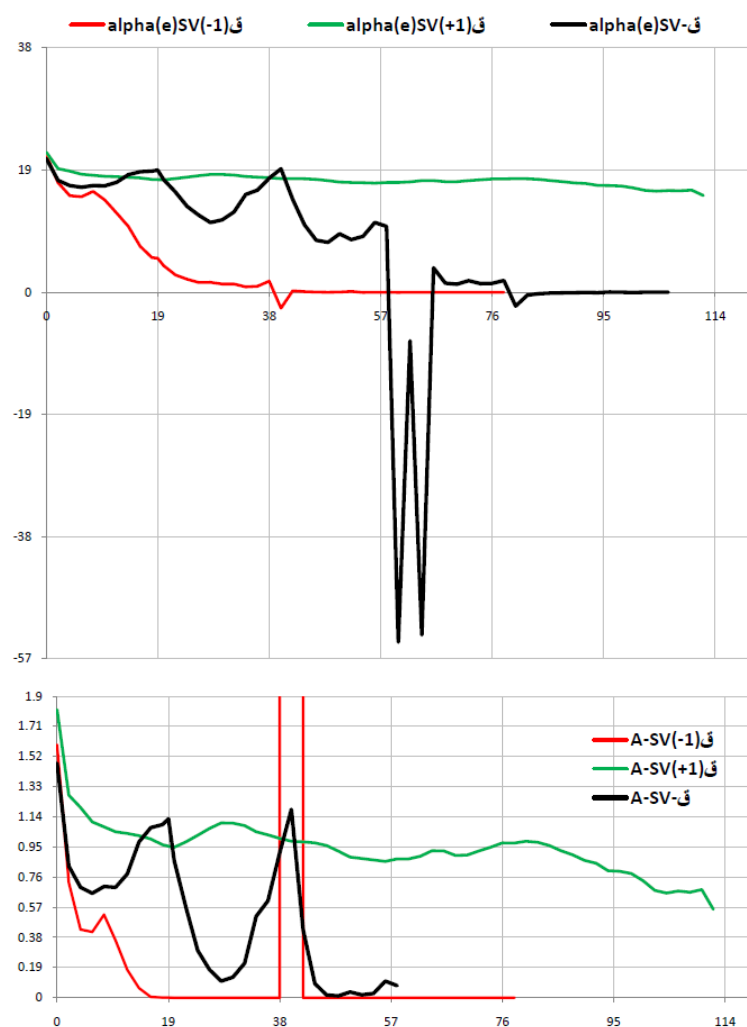


Figure 88. Subtraction/Addition sensitivity tests of A-SV and $\alpha(e)SV$, conducted for letter qaf in Quran. Computed F-parameters after manipulation of Quran by adding one qaf to (+1, in green), and subtracting one qaf from (-1, in red), each chapter in Quran. Notice the absolutely devastating effects of such minimal manipulations on the precisely regulated NBFS couplings and effects initially observed for the real Quran (plotted in full black lines and also seen in Figures 43-44).

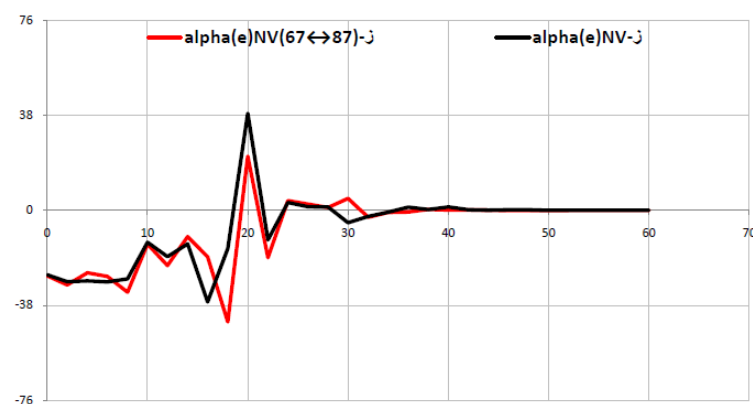


Figure 89. Permutation test of $\alpha(e)NV$ -zin computed for the Natural Variation of letter zin (ز) in Quran. Here positions of only two chapters 67 and 87, have been switched (the result is plotted in red). Notice complete disappearance of Am and AM at ± 38 , initially observed for real Quran plotted in black (also seen in Figure 67).

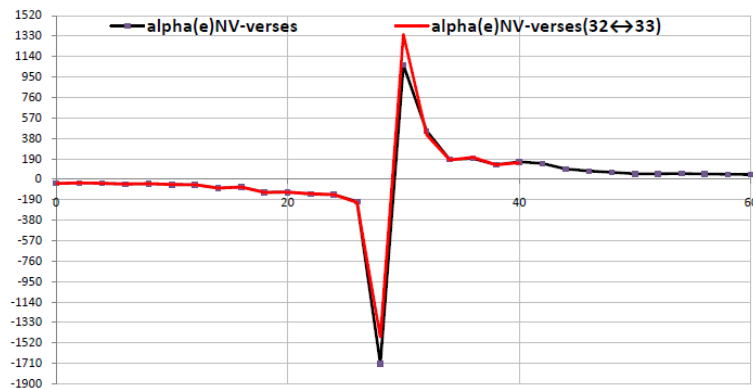


Figure 90. Permutation test of $\alpha(e)NV$ -verses computed for the Natural Variation of verses in Quran. Positions of two chapters 32 and 33 have been switched (result shown in red). Notice the interesting event of disappearing an absolute minimum, a 4-d MN at Am(28, -1710.9) initially observed in real Quran (plotted in black), and creation of a new though less accurate, 3-d effect but this time as an absolute maximum at AM(30, 1334.6). Notice, that any such chapter switching will affect all 31 Natural Variations, and not just one Variation.

11. NBF Structured Quran: The Mathematical Interpretation of Chapter 74

It would seem pointless for an author to undertake the enormous task of complete mathematical coding of a book without even giving a hint to its prospective readers concerning this code and its purpose. In spite of his many shortcomings, R Khalifa should be credited for pointing to chapter 74 of Quran (highlighted from 74:24-35) as the announcer of the mathematical code or as he puts it, "mathematical secret" of Quran (Khalifa 1982).

We shall now present 3 observations that strongly suggest that the NBF Structure of Quran, should indeed be the "mathematical secret" of Quran, the very secret that will prove its nonhuman origin. However, before presenting these observations let us define a method of constructing variations of specific words or names in a book.

11.1 Construction of "word" or "name" Variations: The MLF Method

Consider a book in English, and suppose we wish to know how many words "cat" there are, or better said, can there be in each chapter of this book. In fact, if we look for the exact word "cat" most probably we will end up with zeros for all chapters. However, one simple and more practical way to do this would be to see how many three letter combinations of c+a+t we can have in each chapter. The procedure is quite simple, we count the number of these letters in all chapters, for instance, suppose in chapter one the frequency of letters c, a, and t, are 250, 431, and 233 respectively, so we can only have 233 "cat"s in chapter one. Doing the same for all other chapters, we can have a full Natural Variation for the word "cat" for this given book. It is quite clear from this example, that the letter with minimum frequency in each chapter determines the frequency of the desired word or name in that chapter, so we shall call this the Minimum Letter Frequency (MLF) method.

In this method, if a letter of alphabet is repeated "n" times in the name of our choice then, the frequency of that letter should be divided by n and rounded down to its nearest integer, before it can be compared to other letters of that name. For instance, if we wish to make Natural Variation of the word "acta" in the above example, we see that we can only have $(431/2)$ a+a, which when rounded down is 215, so we can only have 215 "acta"s in chapter one and so on. Using these simple procedures we can easily make NVs and thereby SVs of any word or name that we wish for any book including Quran. *All name variations in this article will be made using the MLF method.*

Notice that in MLF constructing of a name variation, some letters may have no contribution at all. For instance, in the above example since letter "a" in all chapters might have the highest frequency, it will have no contribution in making the word "cat", but since its frequency is cut in half for the second word "acta" it can be a contributor in making variation of the word "acta".

We will now begin to introduce the NBFS hints pointing to the connection between the mathematical code of chapter 74 and the NBF Structure of Quran.

11.2 Observation no.1: The Fundamental Coupling of alphabetic characters pointing to the keyword "SAQAR" (سقر)

It is said in chapter 74, that the opponent of the divinity of Quran will be confronted with a "SAQAR" (سقر) with

19 on it. Table 7 shows the sign of, J-alpha, computed for all 31 Sorted Variations in Quran. Observe, from the last column of Table 7, that excluding the major variations of verses, words, and letters, 19 out of 28 alphabetic characters show Fundamental Couplings and out of these 19 letters, *only 5 letters show fundamental coupling at 19*, and these are: alif- الف, ra - ر, sin - س, qaf- ق, and lam - ل.

Out of these 5 letters, the combination of alif+lam (ال) makes up the definite article in the Arabic language (equivalent to "the" in English). The three remaining letters, are the letters that make up the word SAQAR سقر.

Table 7.

| J | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | FC |
|----------------------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| J-alpha(e)SV-الف | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | 19 |
| J-alpha(e)SV-ب | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | 17 |
| J-alpha(e)SV-ت | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | NA |
| J-alpha(e)SV-ث | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 11 |
| J-alpha(e)SV-ج | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | - | + | + | + | + | + | NA |
| J-alpha(e)SV-ح | - | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | 23 |
| J-alpha(e)SV-خ | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | - | NA |
| J-alpha(e)SV-د | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | NA |
| J-alpha(e)SV-ذ | - | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | NA |
| J-alpha(e)SV-ر | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | 19 |
| J-alpha(e)SV-ز | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 13 |
| J-alpha(e)SV-س | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | 19 |
| J-alpha(e)SV-ش | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | 17 |
| J-alpha(e)SV-ص | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | - | - | - | + | + | + | NA |
| J-alpha(e)SV-ض | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 13 |
| J-alpha(e)SV-ط | - | - | - | - | - | - | - | + | + | + | - | + | + | + | + | + | + | + | + | + | + | NA |
| J-alpha(e)SV-ظ | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 9 |
| J-alpha(e)SV-ع | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | NA |
| J-alpha(e)SV-غ | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | - | + | + | + | + | + | NA |
| J-alpha(e)SV-ف | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | 17 |
| J-alpha(e)SV-ق | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | 19 |
| J-alpha(e)SV-ك | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | 15 |
| J-alpha(e)SV-ل | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | 19 |
| J-alpha(e)SV-م | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | 17 |
| J-alpha(e)SV-ن | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | 17 |
| J-alpha(e)SV-هـ | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | + | 15 |
| J-alpha(e)SV-و | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | 17 |
| J-alpha(e)SV-ي | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | + | 17 |
| J-alpha(e)SV-letters | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | 19 |
| J-alpha(e)SV-words | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | + | + | + | + | 19 |
| J-alpha(e)SV-verses | - | - | - | - | - | - | - | - | - | - | - | - | - | - | + | + | + | + | + | + | + | 25 |

Signs of J-alpha computed for the specified 31 Sorted Variations in Quran. FC indicates at what number values of J and alpha coincide (Fundamental Coupling).

We will now begin to SF-analyze the two keywords of chapter 74 to see how they are NBFS marked in Quran.

11.3 Observation no.2: The NBFS Marking of the Keyword SAQAR (سقر)

Figure 91 shows simultaneously, the Natural Variation of the keyword SAQAR (سقر) and NVs of all letters of alphabet which contribute to its making through the MLF method, as explained in section 11.1. Note that the frequencies of letters alif and lam (ا, ل) are so high in each chapter that these letters have no contribution in making the word السقر so the Natural Variations of "السقر" and "سقر" are identical. In fact, the main contributing letters in construction of the NV of word SAQAR (سقر) are sin س, and qaf ق.

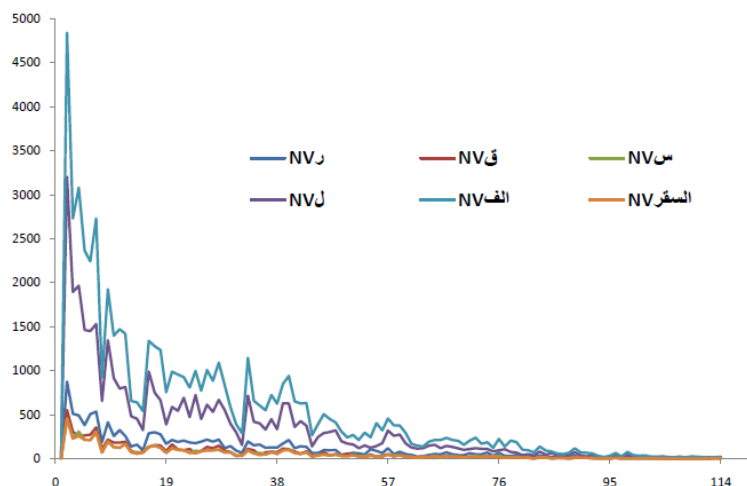


Figure 91. Natural Variations of the indicated letters and NV of the word (name) "SAQAR" in Quran

In Figure 92, $\alpha(e)SV$ -SAQAR, shows a Fundamental Coupling at (19, 19) as well as a second coupling at (19, 38). Meantime, $K(e)SV$ shows a $Am(74, 76)$ (it is interesting to note that 74 is number of the chapter where both keywords "Almuddath-thir" and SAQAR are present in Quran).

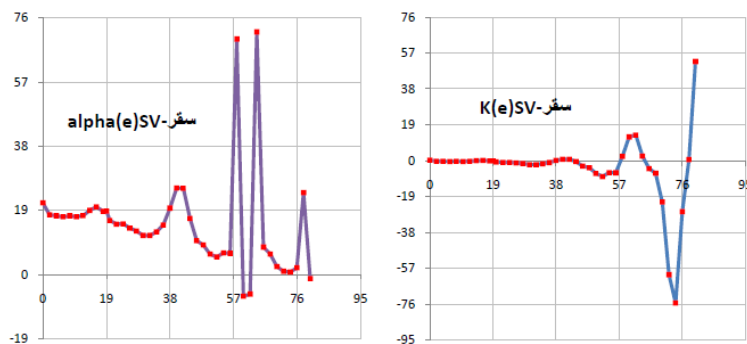


Figure 92. F-plots of the Sorted Variation of the word "SAQAR" in Quran

Observe for $\alpha(e)SV$ -SAQAR, the Fundamental Coupling at (19,19), followed by another precise coupling at (38,19). Also notice a precise absolute minimum for $K(e)SV$ -SAQAR at $Am(74, -76)$.

We consider this NBFS marking of SAQAR as a second hint by Quran to indicate the connection between the NBF Structure of Quran and the "concealed mathematical secret" of chapter 74.

11.4 Observation No.3: The Phenomenal "Almuddath-thir" (المدثر) Effect.

We will now observe an impressive effect in connection with the NBFS marking of the most important keyword in chapter 74, to be called the NBFS "Almuddath-thir effect". Figure 93 shows simultaneously, the NVs of the keyword المدثر (MLF constructed), and letter theh ث. Almuddath-thir's NV is constructed only by letters theh and in five points by letter dal (ﺩ), with no contribution from letters alif, lam, mim and ra. The five dal points are seen as little red squares in lower right corner of Figure 93. Notice that, NVs of Almuddath-thir and letter theh are almost identical, so one might expect to see almost the same F-plot for المدثر as is seen for letter theh ث.

Comparing the F-plots of $\alpha(e)SV$ for letter ث and المدثر shows however, an impressive NBFS event: The absolute minimum at $J=30$, observed for $\alpha(e)SV$ -ث (see Figure 26), has now shifted exactly to $J=19$ for $\alpha(e)SV$ -مدثر, and a new maximum for A-SV is also created at $J=19$ (see Figure 94).

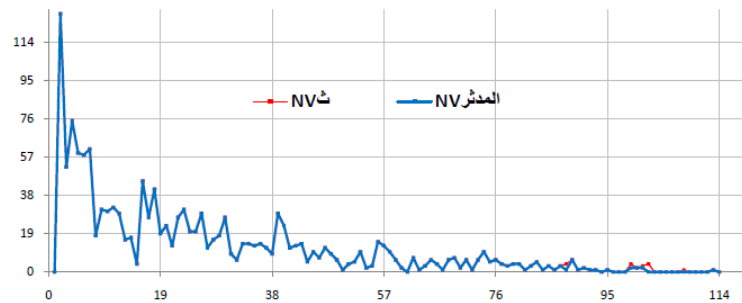


Figure 93. Simultaneous plots of Natural Variations of the word "Almuddath-thir" and letter theh

To see the amazing peculiarity of this event, notice from Figure94 that both sine and cosine terms have been used in the regression equations for computations of the J =odd terms in the observed range. It was seen as is evident from these graphs that $\alpha(e)SV$ for all values of J from 0 to 30, and for both sine and cosine odd terms, computes as positive but only and only when sine term is used at $J=19$, it computes as a sharply negative value, thereby creating a pronounced dip at $J=19$. The value of this minimum is 54.1. At the same time, base-independent F-parameter A-SV shows exactly at the same $J=19$, again with the sine term, a sharp maximum with the value 43.1 (Figure 94 left).

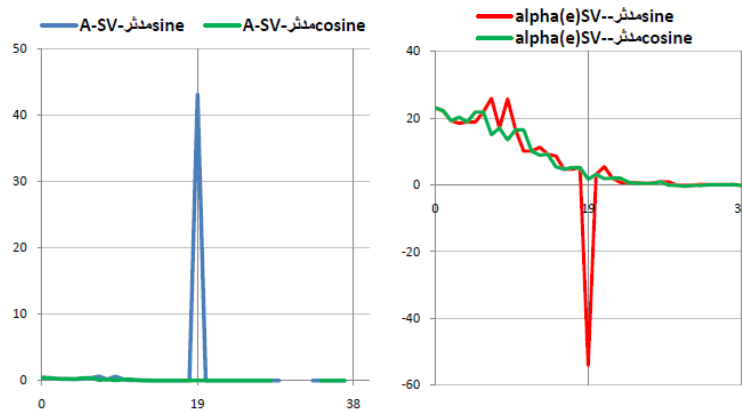


Figure 94. F-parameters computed for the Sorted Variation of the word "Almuddath-thir" in Quran. Blue and red represent computed with sine, and green represents computed with cosine, for odd value J terms.

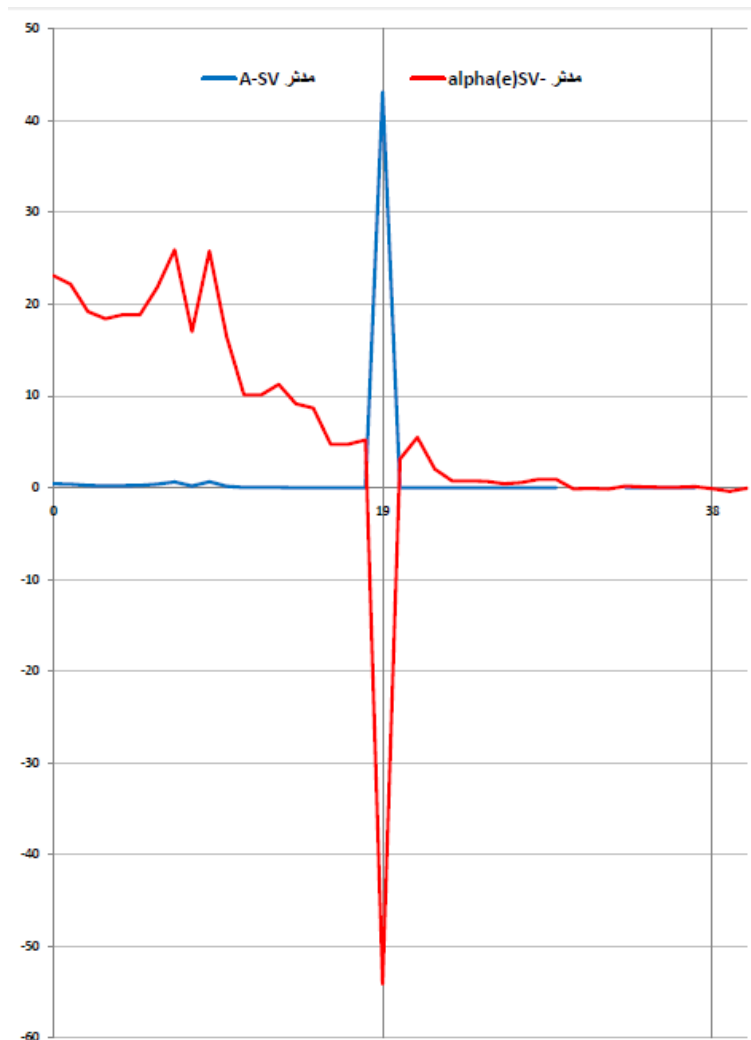


Figure 95. Simultaneous plots of A-SV and alpha(e)SV of Figure 94

The phenomenal "Almuddath-thir effect" manifested by distinct and pronounced NBFS markings in the F-plots of the word "Almuddath-thir". The effect is observed when the sine term is used in regression computations for odd values of J: Both A-SV and alpha(e)SV show sharp maximum and minimum values exactly at J=19. The "well" (in red) is $57=19 \times 3$ deep, and the height of the peak from top of the well (in blue), is exactly 40.

12. The NBFS Markings in Quran of the Names of Some Relevant Mathematicians

Having observed very interesting NBF regulations for the key words of chapter 74, it was decided to check some other words (names) by the SF-analysis of their Variations in Quran. This idea was mainly triggered by observation of Figure 42, the F-plots of letter feh. Notice in the F-plots of letter feh, presence of exceptionally sinusoidal waveforms as compared to the F-plots of all other letters. We noted that letter feh is the initial letter for "Fourier" so we decided to make the word Variation of the name "Fourier" which in Arabic is written as "فوريه" and then SF-analyze its Sorted Variation, just like we did for "السفر" and "المدثر".

The result is seen in Figure 96 which not only shows some unique periodic features, but also shows some interesting NBFS couplings and effects. Following this observation it was decided to SF-analyze the first name of Fourier which is "Joseph" or in Arabic written as "جوزف". The results of this latter analysis looked even more fascinating and it was therefore decided to SF-analyze in Quran, names of some other mathematicians whose innovations are instrumental for both the construct and detection of the mathematical structure of Quran. In the following sections, first we will briefly explain the possible reason for the NBFS marking of each mathematician's name and then show the F-plots of the Sorted Variation of his name in Quran.

12.1 NBFS Marking in Quran of "Joseph Fourier"

The French mathematician-physicist, NBFS marked in Quran because the "Fourier series" is fundamentally instrumental in the NBF Structure of Quran.

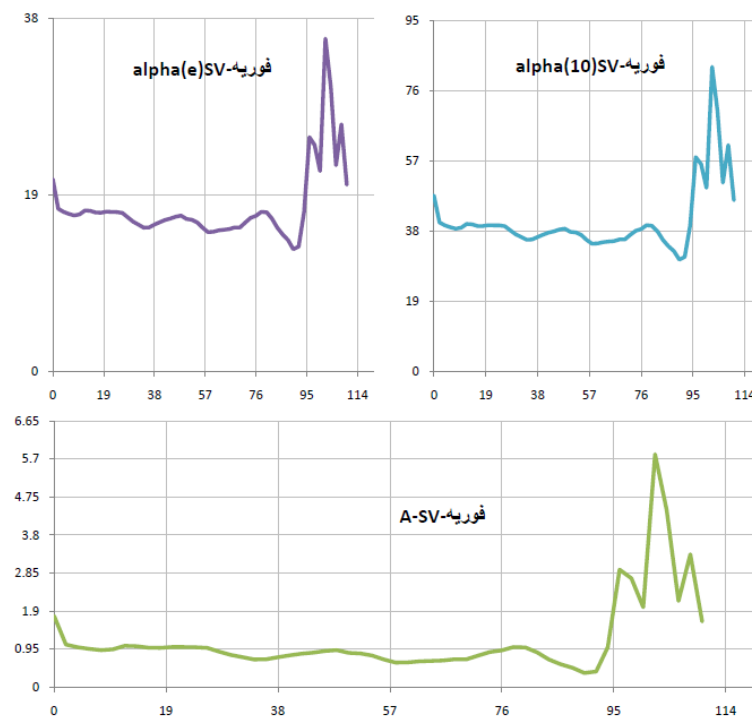
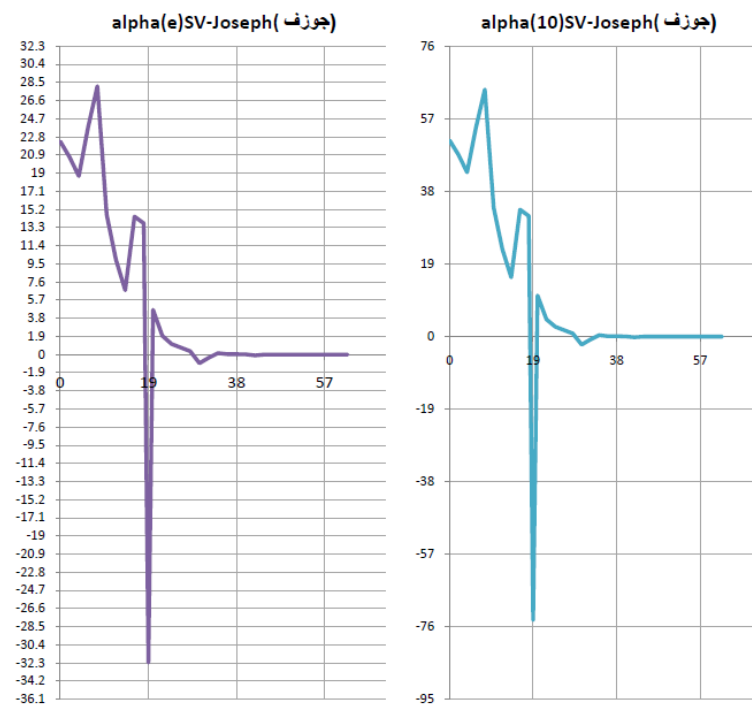


Figure 96. Exceptionally sinusoidal-shape F-plots of the SV of the name "Fourier" (فوريه) in Quran
Notice also, in addition to the sinusoidal features, the NBFS couplings and effects observable from these F-plots.



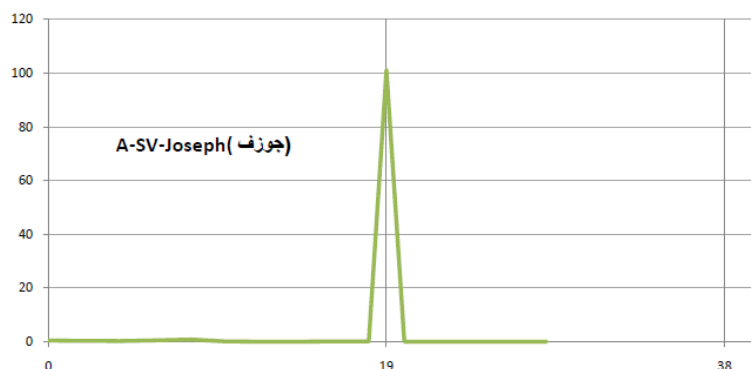


Figure 97. F-plots of the Sorted Variation of the first name of Fourier "Joseph" (جوزف) in Quran. The prominent NBFS regulation appears here as a coupling and absolute minimum established exactly at **Am(19, -32.3)** for $\alpha(e)SV$ -Joseph. A lesser exact Am(19, -76), is also established for $\alpha(10)SV$ -Joseph. Meantime, A-SV-Joseph shows a sharp maximum exactly at **J=19** with a value of 101.

(Some Arabic speakers write جوزيف instead of جوزف but PVs are identical in both cases, because "ی" is a noncontributing letter in the MLF made SV of Joseph)

12.2 NBFS Marking in Quran of "Johann Carl Friedrich Gauss"

The German mathematician-physicist, NBFS marked for his invention of the "Least Squares Method" which is instrumental in construct & detection of the NBF Structure of Quran.

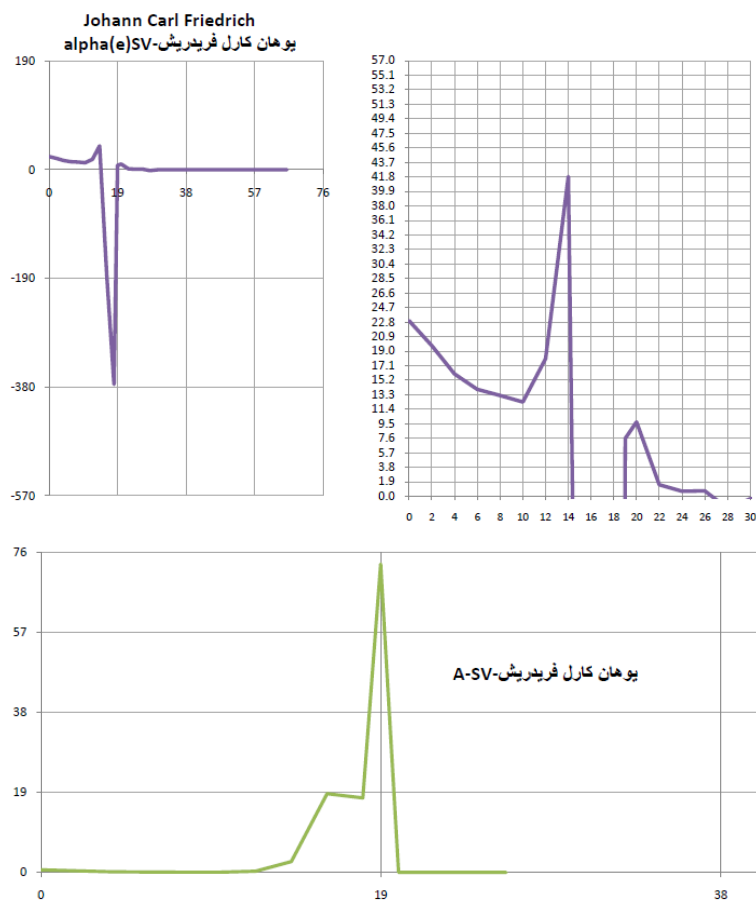


Figure 98. F-plots of the Sorted Variation of the name "Johann Carl Friedrich" in Quran. Here, $\alpha(e)SV$ starts at (0, 22.8), shows a (2, 19) at the first introduction of the Fourier terms, shows an absolute maximum at exactly **AM(14, 41.8)**, an absolute sharp minimum at **Am(18, 38E1)**, a coupling at (19, 7.6), and a maximum at **M(20, 9.5)**. Also, the base-independent A-SV shows a relatively sharp maximum exactly at

J=19.

Note that, F-plots of Carl "كارل" are identical to the F-plots of letter "ك" (Figure 45), so Gauss's full first name(s) were used for F-plot computations.

12.3 NBFS Marking in Quran of "Leonhard Euler"

The Swiss mathematician-physicist, NBFS marked for his important studies of the numbers including "e" (Euler's number), " π ", and their relation (Euler's identity). As noted before, "e" and " π " are the two pillars of the mathematical constitution of Quran. Euler is also credited for preliminary investigations of the Fourier series.

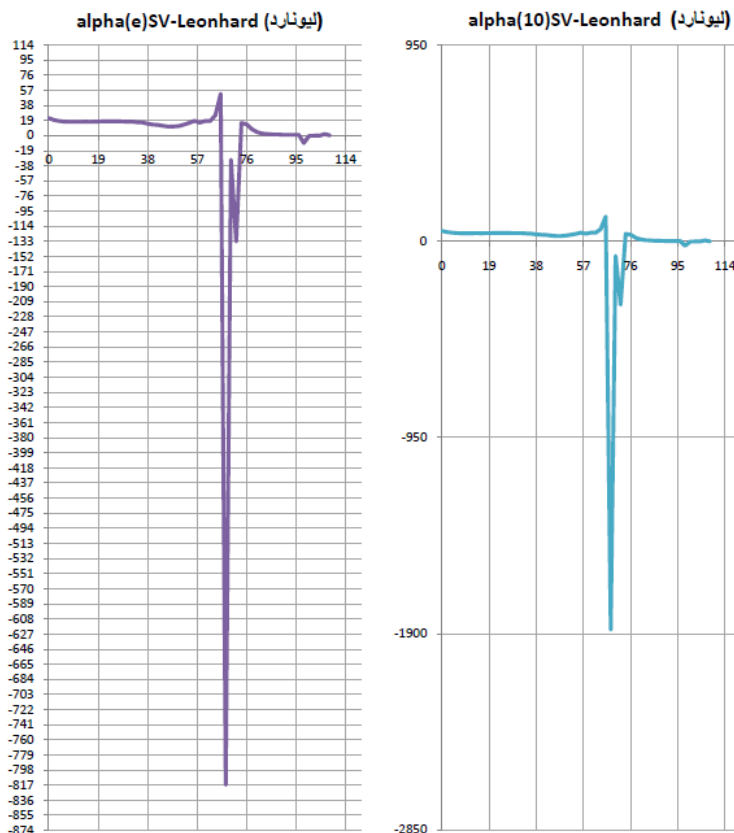
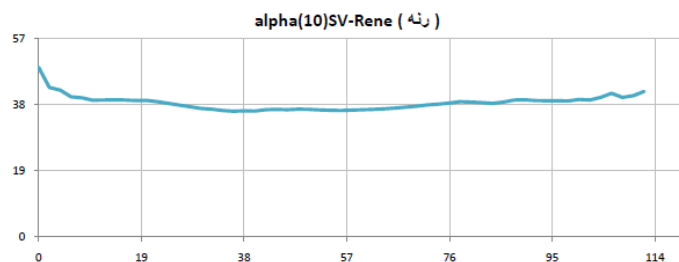


Figure 99. F-plots of the Sorted Variation of the name "Leonhard" (ليونارد) in Quran

Main effects observed from the F-plots of the SV of "Leonhard" (ليونارد) are: Constant Value at **MN(19)** is observable for $\alpha(e)SV$ from $J=2-32$, with couplings at **(19, 19)**, **(57, 19)**, and a *sharp absolute minimum* exactly at $Am(68, -817=19 \times 43)$, a maximum at $M(70, -30.4)$, and a minimum exactly at $m(72, -133)$. Meantime, $\alpha(10)SV$ shows a *sharp absolute minimum* at $Am(68, -19E2)$, followed by a local maximum exactly at $M(70, -70.3)$, a near minimum at $m(72, -304)$, and a maximum at $M(74, 38)$.

12.4 NBFS Marking in Quran of "Rene Descartes"

The French philosopher, mathematician, physicist, NBFS marked for his pioneering introduction of modern mathematical analysis methods and particularly introduction of the "Cartesian Coordinates" instrumental in computations and visual observations of the NBFS and GES couplings and effects in Quran.



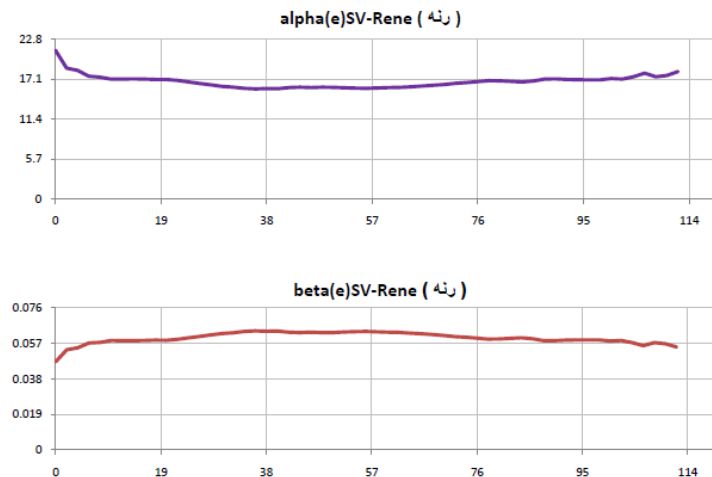


Figure 100. F-plots of the Sorted Variation of the name "Rene" (رنه) in Quran

The prominent effects are: **Constant Value at MN(38)** observable for $\alpha(10)SV$, from $J=10$ to $J=102$, with consecutive couplings at (19, 38), (38, 38), (57, 38), (76, 38), and (95, 38). Notice also, that $\alpha(10)$ terminates at a 3-d MN maximum at $M(112, 41.8)$. Also, $\alpha(e)SV$ -Rene makes couplings at (19, 17.1), (95, 17.1), while $\beta(e)SV$ -Rene makes couplings at (19, 0.057), and (95, 0.057).

12.5 NBFS Marking in Quran of "Isaac Newton"

The British physicist-mathematician, NBFS marked for his fundamental role in invention of the "Differential calculus" which is essential to be used in "Least Squares Method" calculations of the NBFS.

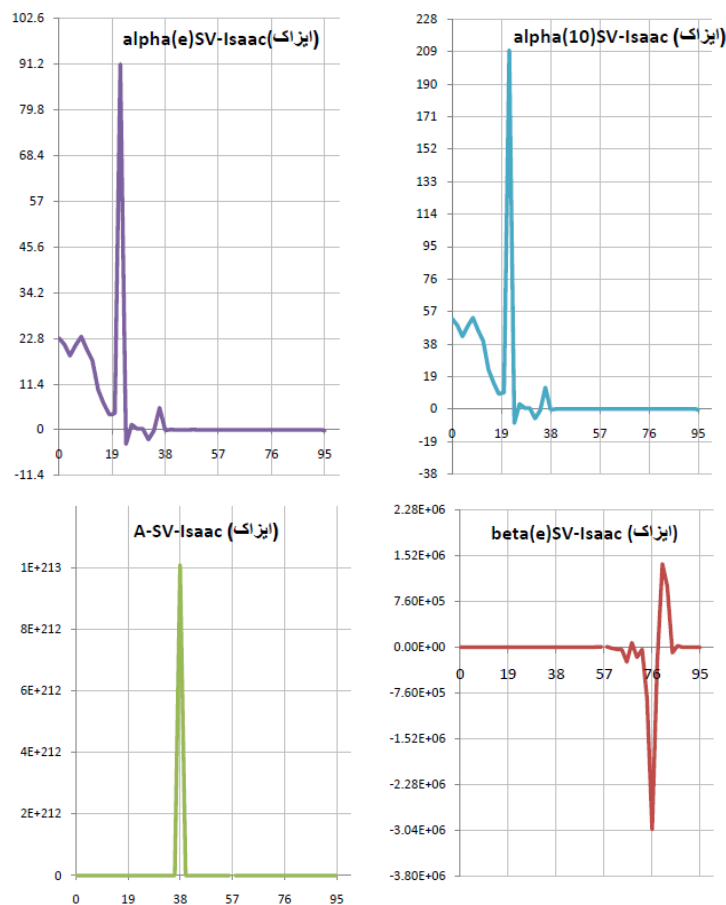


Figure 101. F-plots of the Sorted Variation of the name "Isaac" (ايزاك) in Quran

Issac, shows more impressive NBF regulations as compared to other names: The F-parameter $\alpha(e)SV$ -Isaac starts at **(0, 22.8)**, makes a minimum and coupling exactly at **m(19, 3.8)**, makes an absolute maximum with a 3-d MN value exactly at **AM(22, 91.2)**. Meantime, $\alpha(10)SV$ -Isaac makes an absolute maximum at exactly **AM(22, 209)**. A-SV-Isaac makes a huge maximum at **M(38, 101E+213)**. Also, $\beta(e)SV$ -Isaac makes a sharp absolute minimum and coupling at **Am(76, -304E+4)**.

12.6 The Sensitivity Testing of the NBFS Name Markings

Observing these NBFS marking of names, It might be suspected that variation of any chosen name in Quran will probably show some NBF effects but this certainly is not the case. It can even be seen that the F-plots of the SVs of these names in Quran some time show more pronounced effects than F-plots of some letters of alphabet that we have observed so far.

We will now show through Subtraction/Addition test, that if the frequencies of these names were different from what they are, that is even by one unit, then, none of these name effects could have been observed. Figures 101-103, show the computed F-parameters for the specified names. In these following Figures (-1) means one unit subtracted from each chapter in Quran, and (+1) means one unit added to each chapter.

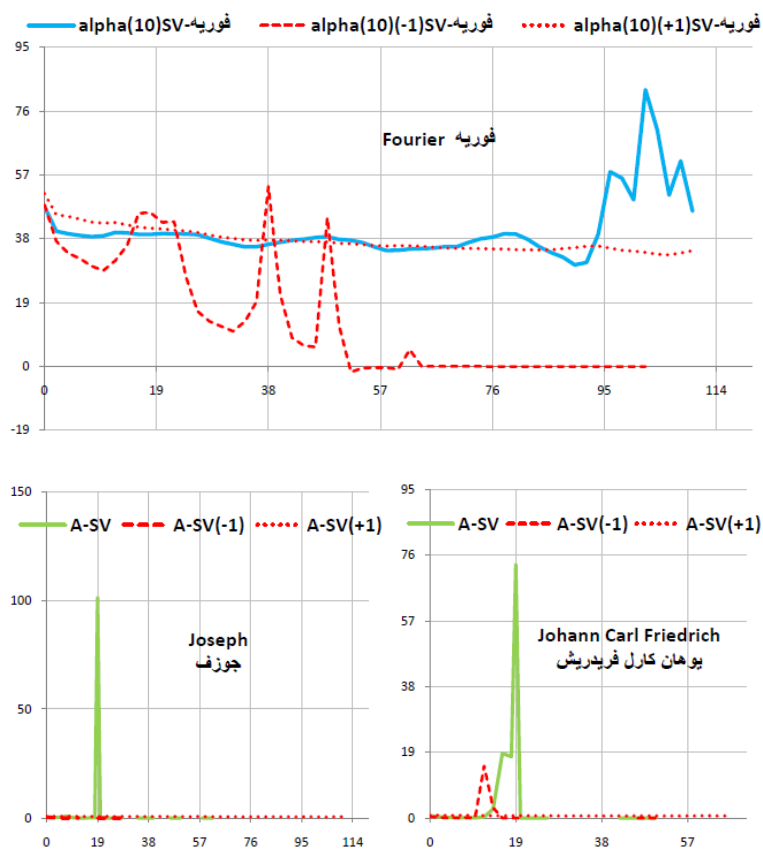


Figure 102. Sensitivity (± 1) Subtraction/Addition tests of alpha and A, for their NBFS name effects
Notice complete disappearance of the original effects observed for $\alpha(10)SV$ and A-SV for Fourier, and A-SV for Johann Carl Friedrich (Gauss). Real Quran F-plots (curves) are shown in full lines.

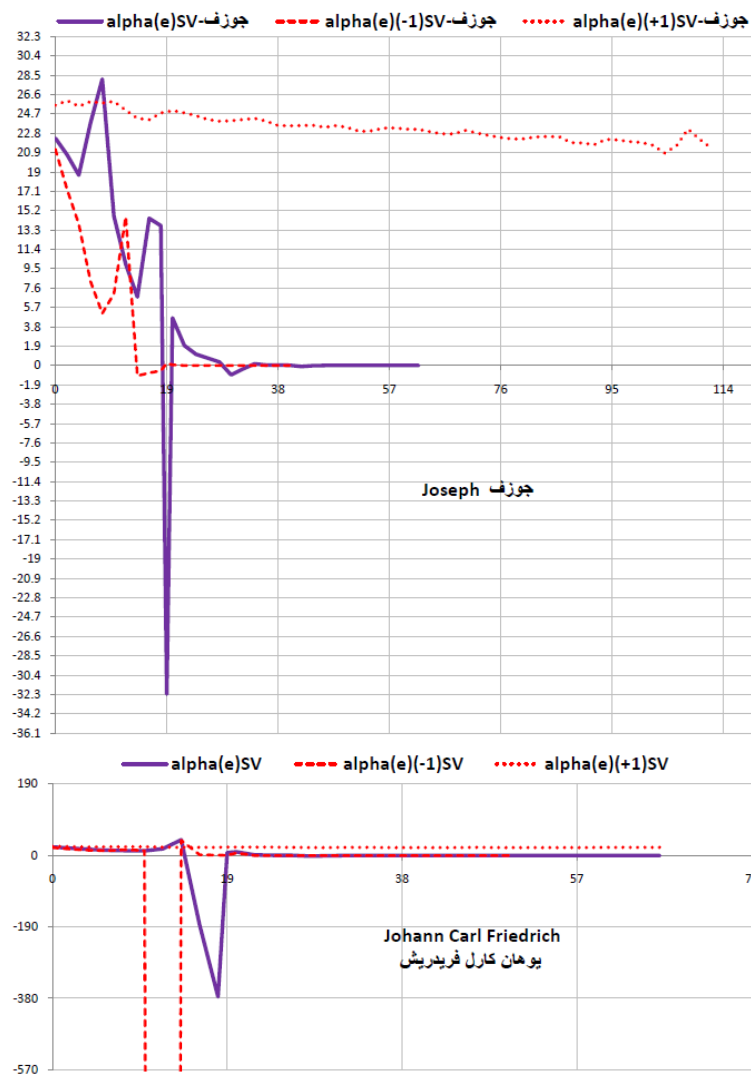


Figure 103. Sensitivity (± 1) Subtraction/Addition tests of the $\alpha(e)s$, for their NBFS name effects
 Notice complete disappearance of the original effects observed for $\alpha(e)SV$ -Joseph, and $\alpha(e)SV$ -Johann Carl Friedrich, first names of Fourier and Gauss, respectively. Real Quran F-plots are shown in full lines.

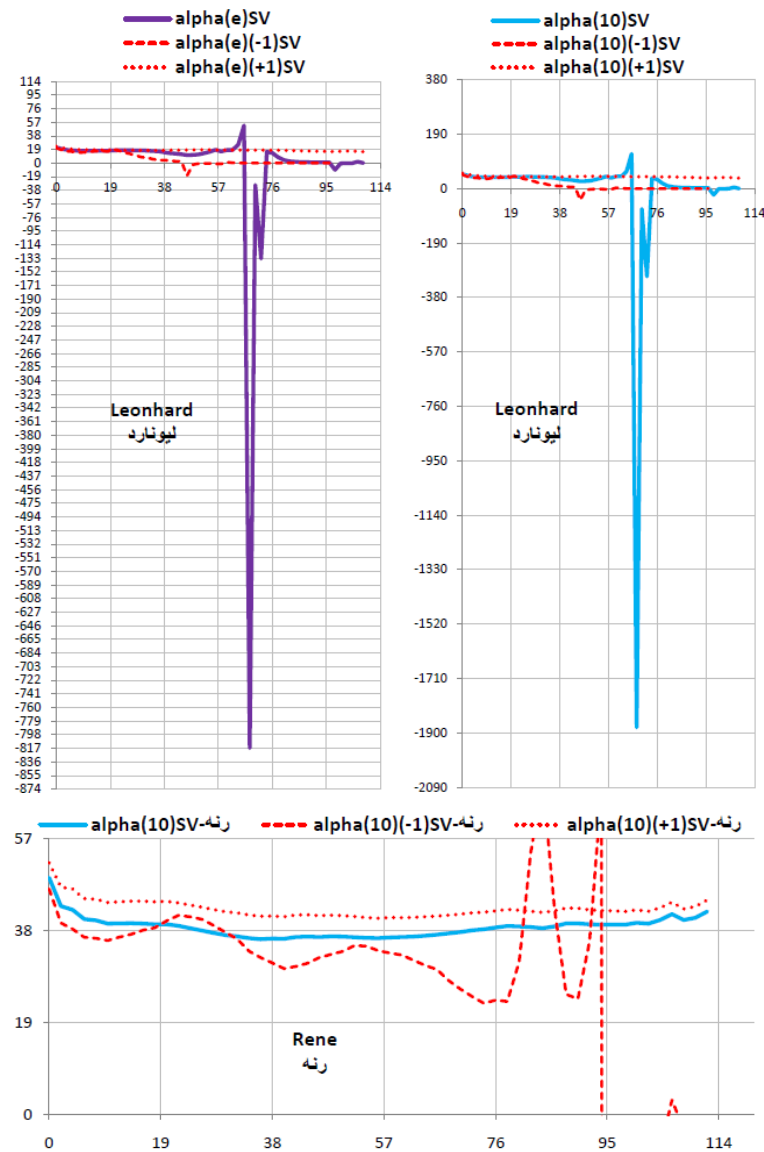


Figure 104. Sensitivity (± 1) Subtraction/Addition tests of alphaSVs, for their NBFS name effects

Notice complete disappearance of the original effects observed for alpha(e)SV-Leonhard, alpha(10)SV-Leonhard, and alpha(10)SV-Rene, as computed for the first names of Euler and Descartes, respectively. Real Quran original F-plots of these names are shown in full lines.

13. The NBFS Markings in Quran of the Names of Investigators in Its Mathematical Structure

Quran appears to have also NBFS marked the names of Muslim investigators of its mathematical constructs. Again, as in previous cases the NBFS effects are observed only for the first names and for their Sorted Variations.

13.1 NBFS marking in Quran of "Rashad Khalifa"

The Egyptian-American investigator, NBFS marked for his work in the integer (19) mathematical structure of Quran.

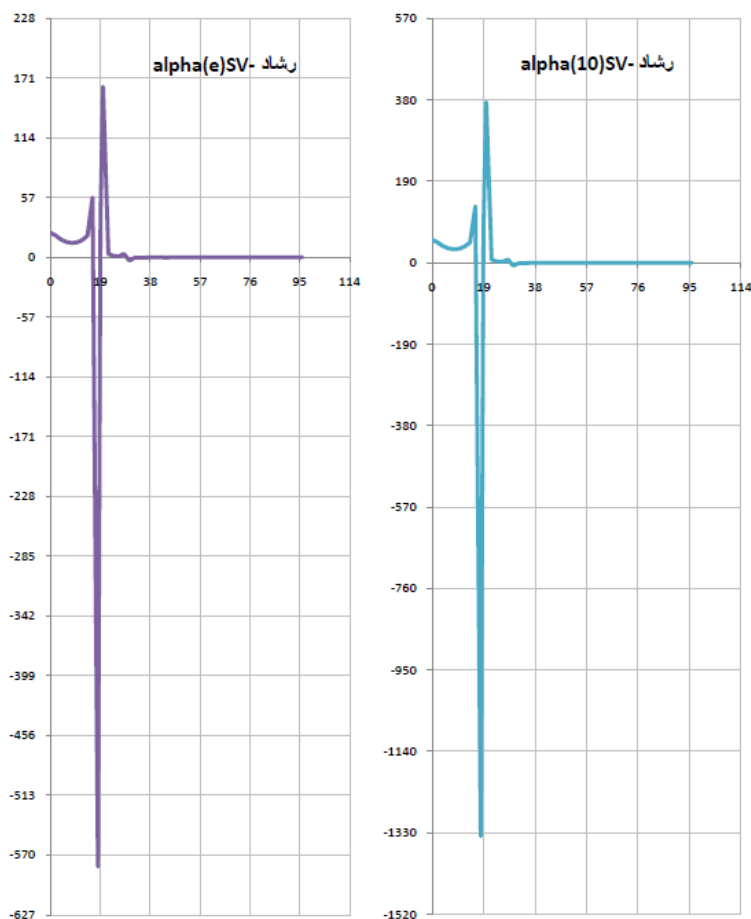
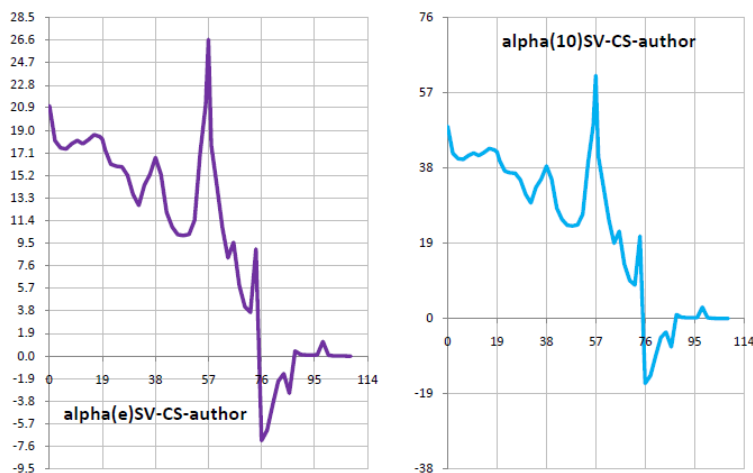


Figure 105. F-plots of the Sorted Variation of the name "Rashad" (رشاد) in Quran
Main NBFS observations: alpha(e)SV-Rashad, has a maximum at $M(16, 57)$, absolute minimum at $Am(18, -57E+1)$, and a coupling at $(19, 38)$. Also, alpha(10)SV-Rashad, has a maximum at $M(16, 133)$, an absolute minimum at $Am(18, -133E+1)$, an absolute maximum at $AM(20, 38E+1)$.

13.2 NBFS Marking in Quran of "The Author of the Computed Scripture (CS-Author)"

The Persian investigator of the real number mathematical construct of Quran, NBFS marked for presentation of the concepts and mathematical-computational structures in the article: "The Computed Scripture..." (note 3)



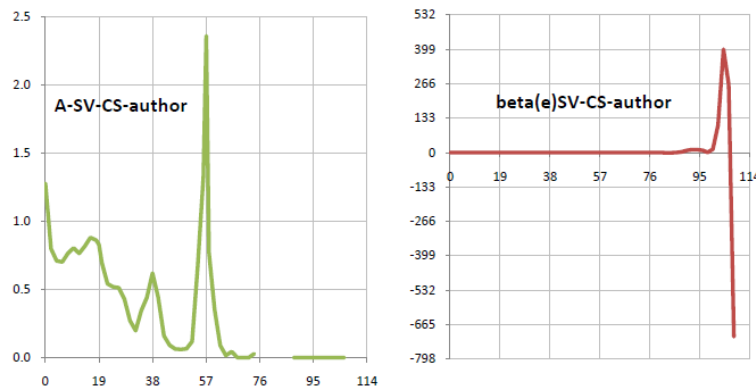


Figure 106. F-plots of the SV of the first name of the CS-author ($2\beta + 1 + \kappa$)

Starting with a (0, 20.9), alpha(e)SV-CSauthor makes a *Fundamental coupling* at (19, 19), shows a maximum at **M(38, 16.7)**, an *absolute maximum and coupling exactly at AM(57, 26.6), and makes an absolute minimum at **Am(76, 7.1)**. Also, alpha(10)SV-CSauthor, makes a *major maximum and coupling exactly at M(38, 38)*, followed by an absolute maximum at **AM(57, 61.4)**, and an absolute minimum at **Am(76, -16.4)**. A-SV shows *distinct maxima at J= 38 and J=57*. Also, beta(e)SV starts exactly at (0, 475E-4), makes a (2, 0.057), shows an exact (19, 0.057), an exact (57, 0.038), a (95, 9.5), and a *sharp absolute maximum at exactly AM(104, 399=21× 19)* and terminates at J=108 due to NT (the cosine term has been used for computation of the odd J=57 in the regression equation).*

Notice also, the important fact that the NBFS markings of the keywords of Chapter 74 and its markings of particular names in Quran represent additional mathematical constraints which can be considered as extra-facets of an already multifaceted quantitative construct of Quran, reinforcing further its MFCW structure. These observations definitely authenticate and solidify further the reality of the NBF mathematical-computational construct of Quran.

It should be mentioned that the SF-analyses of the names of individuals took place in the final stages of completion of this article. An interesting observation that was not mentioned in NBFS name markings, because we did not want to appear too speculative in this article, is the *specific markings* of names in Quran.

As an example, observe from Figure 97, that computation of the F-parameters for the SV of "Joseph" in Quran has terminated at J=62 (due to HC elimination of the linear term in the regression equation) and Fourier actually died at the age 62. It is interesting to see that when frequencies of Josephs are changed in Quran, not only the NBFS effects completely disappear but also the terminations no longer happen at J= 62 (see Figure 103). Having looked more carefully at the F-plots of other names, it was noted that for every name at least one distinguished number could be identified in the F-plots which related to that specific person. For instance, the last minimum observed for beta(e)SV-Isaac is at J=84, which coincides with Newton's age when he passed away.

14. Summary

In this article we first introduced the concept of MFCW, a new concept never introduced before, not because of its any inherent complexity, but simply because there had been no text known to exist to necessitate its introduction before. Conditions that would qualify a text to be considered a MFCW were explained and it was shown that if Quran can be proved as a case of MFCW, then the Arabic language cannot be a human made language and should be a byproduct of compilation of Quran.

In order to facilitate the comparative study of the textual structures and after introduction of the Principle Variations or the PVs for a book, we introduced the concept of a "Normal Book" and showed in particular that because of the stochastic nature of human writing, insofar as their chapter word frequencies are concerned, these writings obey a uniform distribution. This modeling of a Normal Book showed good agreement with the observed works of human literature while showing a sharp contrast with the construct of Quran. The prominent Cross Diagonal PV's of words in Quran were shown to present clear evidence for its exceptional exponential construct. Intelligent mathematical structuring of Quran was further reinforced through observation of the Pi-e and other Graphical couplings.

Systematic tests of the structural sensitivities showed high susceptibilities of the observed graphical effects to, in

some cases, slight manipulations in construct of Quran, supporting even further the intelligent design. Based on these and other observations it was shown that the General Exponential Structure (GES) and its manifestations can be considered as one of the facets of a multifaceted mathematical structure of Quran.

Directed by the couplings observed between π and e , the possible relation between these numbers and number (19), the previously observed mathematical code of Quran was studied. In an analysis of integers, it was observed that number (19) shows the best overall relative divisibility to both π and e , which provides a justifiable mathematical-physical reason for its selection as the numerical code of Quran. It was therefore concluded that π and e , as being the two most important natural numbers which play fundamental role in mathematical description of the physical universe, have also been chosen as the pillars of the mathematical construct of Quran. From this point of view, the much publicized integer (19) construct of Quran can also be considered as the extension of a more general π - e constitution into the realm of integers.

Next, we showed through a consistent and systematic Stepwise Fourier analysis of verses, words, and letters of alphabet, that a very peculiar but precisely tuned NBF regulation has been superimposed on the general exponential construct of the Principle Variations in Quran. These regulations manifest themselves through numerous NBFS couplings and effects. Precision tunings of the NBFS was particularly observed through its extremely accurate manifestations for certain letters and characters. In particular, sensitivity tests showed that even minimal additions and subtractions of characters, and also, alterations of chapter positions can be absolutely detrimental for the NBFS couplings and effects observed for both Principle Variations in Quran.

A simple MLF method for constructing PVs of any desired word or name was introduced and through a comparison of the fundamental couplings and also through observations of clear NBFS couplings and effects in the F-plots of the two keywords of chapter 74, it was suggested that the NBF Structure indeed qualifies to be the very subject of the "hidden mathematical secret" of Quran stated in that chapter.

In a following interesting SF-analysis of the SVs of the first names of a number of renowned Christian mathematicians and physicists whose innovations and inventions were seen as absolutely relevant to the NBFS and GES, clear NBFS markings were observed. These NBFS effects also showed extreme sensitivities to the slightest quantitative manipulations. This mathematical "NBFS name marking" was also observed for the names of two Muslim investigators of the mathematical construct of Quran.

15. Discussion and Conclusions

We have presented in this article observations that have resulted from a systematic and consistent analysis of the Principle Variations in Quran and which consistently show some real number parametric regulations based on number (19). It is very important to note here, that (19) is the same number which has shown regulations for another independent integer construct in Quran (Khalifa 1982).

The question of why quantitative construct of Quran has been built based on such a peculiar mathematical-computational scheme can hardly be expected to find a clear answer. It is certain though, that we are observing "regulation" and "design" as attested by numerous observations and sensitivity tests of structures presented in this article. It is clear that every letter, every word and every verse is used in Quran in compliance with an amazingly delicate mathematical scheme which can qualify Quran as a case of MFCW.

As to why the computed F-parameters are not exactly multiples of 19 and we have had to define an interval Δ , it should be reminded that since frequencies of words and letters are quantized, naturally, changes in frequencies of words and letters are also quantized. We have already seen in the sensitivity tests, that changing the frequencies even by one unit can have dramatic effects on the computed F-parameters such that sometimes their values can change by orders of magnitude. Perhaps if the chapter frequencies could have non-integer values then we could have expected F-parameters with MN values of higher precisions. So, as we can see it now, it can only be speculated that these effects have somehow been optimized both for their occurrence frequencies, and for their accuracies.

Imagine now, that Quran could have used much simpler mathematical schemes which would still qualify it as a case of MFCW like for instance, a very accurate exponential construct (without any wave features) such as $w(i) = Ae^{\beta i}$, or a functional form which shows the exact frequencies in each chapter for instance, $w(i) = 5i^2 + i^3$. We can speculate though, that a simple form function once discovered would need no sophisticated computer assisted computations to show its effects. Such formulated structures could have been discovered two or three hundred years ago. But apparently, Quran has intended its NBF Structure to be discovered only in a particular era in the human civilization. Therefore, some time-dependent elements of the humans' technology (computers) have also been mixed with the mathematical concepts used in its scheme. The mathematical scheme is so

designed that it can be detected in an era of advanced enough technology and when sophisticated computers and computational methods are available and a large number of people are able to see and understand it. The NBF Structure could not have possibly been discovered even 100 years ago, it's a structure with a well-determined time for it to be observed.

Consider now the elements of as we call it "the mathematical message of Quran": Some relatively modern and well known mathematical and statistical concepts such as the Fourier series, Least Squares method, Cartesian representations, etc., have been employed to pack a peculiar but directed message. Although the scheme is indicative of a highly delicate mathematical structure, but is observable by a large number of people possessing some average mathematical-computational skills. All needed to observe GES and NBFS effects is a PC or a laptop with some very common computing software.

15.1 NBFS Marking of the Keywords and Names - Quran's Mathematical Scenario

The fact that the MLF made variations of names has consistently shown NBFS effects and for 10 different names, and that slight manipulations in the frequencies of these name variations result in complete disappearance of all observed effects, can by no means be attributed to accident. In fact, we also SF-analyzed many other names, including some Arabic names, but such sharp and pronounced NBFS effects were not observed.

Quran's Principle Variations for letters, words, names, etc., have been precisely mathematically regulated such that when the "SF-analysis" is applied to them, they will show certain "NBFS" effects. However, the SF-analysis and Quran's quantitative structure have been constructed based on some mathematical-computational concepts (and to-be-invented machines) say, a, b, c, etc. But this mathematical scheme of Quran will not be discovered before all its conceptual elements and objects have been discovered and have come to existence. The Author of Quran has already selected and has "marked" in Quran certain individuals named A, B, C, etc. These individuals will have the mission to introduce these mathematical concepts to the world, during a historic course of development of human knowledge. The brilliance of this scenario is particularly noted from the way of markings and detection of these names which is consistent and in accordance with the SF-analysis itself, thereby showing to its future observers the direct relation between these individuals and the elements of the mathematical construct of Quran.

What happens next is that at some predetermined time the concept "a" will be taught or "inspired" to individual A, and at some other time the concept "b" will be taught to individual B, and so forth. Finally at some predetermined time in the future, when all the elements of the ultimate discovery have become known and are present, the structure and its implications will be discovered and publicized.

The genius of this mathematical scheme shows not only through its pronounced NBFS effects that are extremely sensitive to manipulations in the text of Quran, but also through its additional individual markings that almost unmistakably identify these names with specific persons (e.g., termination at $J=62$ for Fourier). It is seen that almost all scientists with fundamental contribution to the mathematical concepts used for the mathematical construct of Quran have been marked through this amazing process.

It is interesting to note that these *name markings* have mainly been done for the *first names* and for their *Sorted Variations*. Notice also, that the NBFS marking of the names of mathematicians and investigators conveys yet another impressive message of Quran: Not only the Author of Quran shows us that He is in full control of the universal affairs, but this also gives us a very important hint as to who indeed is behind teaching humans their "knowledge of things", as will be discussed in the next section.

Another interesting point to note is that all these great scientists (four of them for sure) have been strong believers in God. Considering the important and novel contributions of these scientists to the human knowledge as a whole, we may arrive at the conclusion that the God-believers among the scientists have been favored to receive or be inspired for "the most novel scientific ideas". NBFS name marking not only authenticates and solidifies further its NBF Structure, but is also indicative of an amazingly accurate futuristic vision of Quran. Realization of a full control of the Author of Quran over all past and future events can also have deep philosophical implications in terms of a free will concept, if people's names, functions, and fates have been pre-determined long before their birth.

15.2 Teaching of Knowledge to Mankind

The fact that Quran bases its mathematical schemes on the concepts, techniques and instrumentations that will become known to man only many hundreds of years after Quran's revelation can only mean that innovative scientific ideas are being inspired to mankind by the Author of Quran Himself. In fact there are verses in Quran where the Author of Quran assumes the full credit, not only for teaching humans their knowledge, but also for

teaching other living things (see for instance, inspiration of bees: Quran, 16:58). In its first ever revealed verses (96:4), Quran states: "He taught man what he knew not before". In this connection, it is interesting to note that Carl Gauss, considered by many as the greatest mathematician ever, believed that his numerous innovative ideas and solutions to the mathematical problems had been inspired to him by God (Carl Gauss - Hmolpedia).

In view of the observed NBFS markings of the names of the mathematicians and also considering the mathematical concepts used in its construct, we may speculate the following points as being included in the general mathematical message of Quran:

- The human knowledge and innovative scientific ideas are mainly the results of divine inspirations.
- Quran respects modern science and technology and in particular, precision mathematical-based sciences.

Interestingly, the notion of divine inspiration of knowledge can mean that the greatest scientific innovations and discoveries may not necessarily be the results only of exceptionally high IQs.

The bulk of mathematical messages of Quran however, relate to the MFCW prime consequence and its follow ups.

15.3 The MFCW Consequences

Considering all observations presented so far in this article, we can see that Quran can qualify as a case of MFCW, because its quantitative structure is fully constrained in the manner defined in section 2 of this article.

If Quran qualifies as a MFCW then by the prime MFCW consequence stated in section 2.2:

- a) Quran should be the Mother Book of the Arabic language i.e., the Arabic language is a byproduct of compilation of Quran. This in itself implies that:
- b) The Arabic language has been taught to its speakers by the Author of Quran (through some teaching process).
- c) Quran, as we see it now, has existed in its full shape long before its revelation and in view of the events mentioned in Quran, contemporary to its revelation, this means:
- d) The Author of Quran has a precise knowledge of the future events and/or full control over the shaping of all events as He wills.
- e) The entire Quran could have been revealed at once with no need for gradual revelation, simply because Quran had existed long before its public introduction.
- f) The Author of Quran can be assumed to have a fundamental creative role due to the arguments presented before in the MFCW section 2.1 of this article.

Verses of Quran in agreement with the above consequences are:

In full agreement with consequences a), and b), in Chapter 55, chronological order of verses 1-4 strongly imply that Quran has been compiled before creation of man and verse 4 also indicates teaching of the language to man afterwards.

In full agreement with consequence d), we can see in Chapter 30, verses 2-4: Defeat of the Romans by the Persians in the "land near Arabia" is stated as a news statement, and it is predicted that (in a period of 3-9 years) the Romans will defeat back the Persians, an event that took place exactly as Quran had predicted.

In full agreement with consequence e), we can see in Quran, (44:3) and (97:1), clear indications of instant revelation of the whole Quran.

15.4 Irreproducibility of Quran and Forever

Now, if any takes up the challenge of Quran and attempts to produce a chapter, similar for instance to chapter 108 which only has 14 words, then in order to comply with the MFCW mathematical schemes of Quran the simulated chapter must have exactly the same number of letters and words and verses as there are in the real chapter 108. This is because chapter 108's construct has already been optimized for all the multifaceted mathematical effects included in it, and the Arabic language which has been built as a byproduct of this optimization process, has already exhausted its linguistic-mathematical potentials in MFCW construction of Quran. In other words, with exactly the same number of alifs, behs, tehs, thehs, ...etc., and with exactly the same number of words and verses as there are now present in this chapter of Quran, it should be impossible to create even a meaningful chapter with a content different from what this chapter now has, let alone it being literary eloquent.

The only way left for the challengers of Quran will be to produce their book with a different mathematical

scheme which in turn will necessitate creation of a new "non-Arabic" language (with none to speak it!) So, the result of such an attempt in the Arabic language should turn out to be a chapter exactly identical to chapter 108 as it is, and the assertion of "irreproducibility forever" seems to have been mathematically proven correct, just by having shown that Quran is a MFCW.

15.5 "The Mather of Mighty Importance"

In conclusion, and in view of the matters presented in sections 15.1 to 15.4 and "as a mathematical interpretation" we presume that it is the NBF Structure of Quran and its MFCW consequences that have been referred to in verse 35 of chapter 74, as being "The matter of mighty importance". This can be considered as a profound message by Quran to the oncoming generations of humans, a message ingeniously packed way back in time forwarded way into the future.

Notice also, in connection with the five Christian scientists NBFS marked in Quran, that in verse 31 of chapter 74 and as one of the main purposes of the (19) based mathematical Structure, Quran states that it will convince "people of the scripture" who are mainly the Christians, that indeed Quran is from God. This can also be interpreted as a friendly reminder by Quran to the Christians not to doubt the divine origin of Quran.

16. Suggestions for Future Studies

We think that we have just barely scratched the surface of Mathematical Structure of Quran and very probably there should be a lot more to be discovered. It seems that mathematical study of Quran can now emerge as an independent field of study that will probably require its own publication(s). We also think that, the MFCW just by its own merits, is a subject worthy of study by the mathematicians and linguists.

As for the particular studies introduced in this article, the SF-analysis which has been used to study the chapter frequencies can also be extended to the study of individual chapters in Quran. For example, the word and letter frequency variations of verses in each chapter can also be SF-analyzed, independently. Other F-parameters of the SF-analysis (e.g., Fourier term coefficients) can also be investigated for detection of possible regulations and effects. The chronological order of chapters can also be SF-analyzed.

In general any additionally observed regulation will definitely reinforce the MFCW structure of Quran and its consequences. Study of Quran from an MFCW point of view might also prove beneficial for structural analysis of the Arabic language. Other mathematical schemes, patterns, and coded information are also possible to have been implemented in Quran and this needs to be investigated.

Acknowledgements

"...and of knowledge you (mankind) have been given only a little" (Quran 17:85)

Quran is a book of guidance and certainly not a book of science and mathematics, but mathematical and scientific signs have been put in it, to both warn and attract their observers. I thank and praise God for letting us see some of the mathematical spectacles of Quran and I salute His messenger of compassion and wisdom, Muhammad (ﷺ), who brought to us the incredible Quran.

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Notes

Note 1 The opening statement "Bismillah...", has not been counted in Intellaren statistics of Quran. However, we found it necessary (the same as Khlifa 1982), that this statement must be included in all analyses of Quran (see also, A note on Bismillah 2015). Therefore, Intellaren statistics should be corrected by adding, **one verse** to the number of verses, **four words** to the number of words, and corresponding number of other letters that exist in "Bismillah..." to their respective frequencies in all chapters. Without exception, all of the analyses presented in this article are performed with inclusion of the opening statement in statistics of Quran.

Note 2 In this article by "quantitative construct (or structure)" we mean quantitative as far as number of words, letters, and verses.

Note 3 The NBFS marking of names in Quran grants no privileges or specialness whatsoever to the marked individuals and is significant only in its connection to the mathematical scenario described in section 15.1.

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