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TEMPO PROPORTIONS AMONG MOVEMENTS AND WITHIN THE SAME MOVEMENT IN L.V. BEETHOVEN'S PIANO SONATAS [1]

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Abstract:

It is certainly not unknown in the field of music interpretation that Beethoven did not use to note tempo indications in the movements of each one of his 32 piano sonatas excepting Hammerklavier op. 106. However, in many cases of the sonatas becomes noticeable –distinctly or concealed– the existence of an internal interface among their movements or/and within the same movement regarding the parameter of tempo proportions which adds rhythmic cohesion and unity to these compositions. From this point of view, the present study aims to detect and annotate the most characteristic points of rhythmical analogies in Beethoven's sonatas based on existing references and tempo indications proposals as well as on the writer's personal interpretative approach featuring as main aspect the dominance of a principal tempo in each sonata that conceives the work as a whole in order to comprise a legit suggestion of executant approach and a potential interpretative guide for the pianists.

Keywords: *piano music, Beethoven, sonatas, tempo proportions, tempo indications, metronome markings, performance, music interpretation, Hammerklavier, Czerny, speed, pulsation, Mälzel, variations, attacca.*

Introduction

It is undoubtedly an admitted reality that traditional Italian tempo indications without specific metronomic markings create great uncertainty for the performer as the composer perceives the speed of a composition in a rather broad area giving the performer permission to choose within that zone. As a result, quite often the same compositions are interpreted by different artists at various tempi as the presence of a range for each tempo term on the scale of the metronome offers a relative freedom, while each tempo approach seems to be correct and persuasive for the listener as well as consistent with the will of the composer for the performer. The principal problem of tempo is caused by the abstract indications (i.e., adagio, allegro etc.) and the absence of precise metronome markings by the composer himself. Consequently, it is not surprising that compositions, featuring the same tempo indication, have different speeds even when they have metronome markings given in definite note values which serve as pulsing time units.

In Hugo Riemann's *Musik Lexikon*, tempo is defined as:

'a measure of time; an indication which determines, for a given occasion, the absolute meaning of note values.' [2]

Characteristically, Beethoven's metronome markings for 'allegro' range from 52 to 144, and for 'adagio' from 56 to 138, [3] while this range can be narrowed by using only compositions which have metronome markings given in the same note value/time unit. These quite broad zones for each tempo make tempo terminology abstract for the definition of the music character of a composition. And, while in J.S. Bach's compositions, where tempo indications are rarely given, the tempo is defined most of the times by the character of each music piece, and the peculiarities of its genre and structure, for other composers the definition of 'correct tempo' assumes a precise metronome marking.

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Is there a 'correct tempo?'

Throughout the ages has been arisen the critical issue, on the one hand, if the composer's tempo is the only correct one revealing his exact intention as well as the degree of this intention's objectivity, on the other, the question of whether the ideal tempo could function as a block to the freedom of the performer's individual creativity. The opposed opinions of outstanding musicians underline the -hard to be answered- nature of these forementioned questions. Rachmaninoff considered to this respect:

'I expose my own feelings by means of tempo, phrasing and dynamic nuances of the music itself […], and in the general outlook it gives the idea of my conception. But any prominent pianist can play my music […] quite differently from myself, and nevertheless, in the whole, the conception would not suffer because good taste and musical feeling of the genuine performer would prevent it.' [4]

While Furtwängler believed that

'actually for each work there is only one conception, only one execution inherent in the music, peculiar to it, correct.' [5]

However, it has to be mentioned that the term 'correct tempo' refers to the general tempo of a composition ignoring the inevitable light fluctuations during its performance. Moreover, the importance of correct tempo has been mentioned also by great composers; For Mozart, tempo has been

'the most essential, the most difficult, and the chief requisite in music', [6]

while according to Stravinsky's opinion

'any musical composition must necessarily possess its unique tempo (pulsation): the variety of tempi comes from performers, who often are not very familiar with the composition'. [7]

Therefore, taking also into consideration the aspects of great composers and musicians, we could come to the conclusion that the genuine interpretation presents a synthesis of the composer's general idea and the performer's individual understanding. A significant deviation from balance brings the interpreter either to soulless scholasticism or to affectation. The absence of metronome marking indications challenges the performer to reveal the composer's intention through the analysis of specific melodic, rhythmic and harmonic elements of each work.

Beethoven and the metronome

As far as Beethoven concerns, for him tempo has been an integral part of a composition, whose successful performance could be determined by a choice of a proper tempo, while a wrong tempo could easily tamper the work's character. Consequently, he has been conscious regarding the selection of appropriate tempo for each character and type of expression of his own works. According to Rudolf Kolisch, his metronomic indications could not be just casual expressions of subjective ideas of interpretation. [8] Particularly decisive has been Johann Mälzel's metronome, manufactured in 1816, and having incorporated Winkel's ideas, [9] which has been received by Beethoven with great enthusiasm and led him in the following year to become the first notable composer to indicate specific metronome markings in his music, as it offered him the means of defining his intended tempo with uttermost accuracy. Beethoven claimed characteristically in a letter to Mosel:

'As far as I am concerned, I have been thinking for a long time to give up these absurd terms Allegro, Andante, Adagio, Presto, and Mälzel's metronome gives us the best opportunity to do so. I give you my word here that I will use them no more in all my newer compositions.' [10]

Although Beethoven maintained his enthusiasm for the metronome to the end of his life and he delivered metronome markings for all his symphonies, most of his quartets, and some other compositions, however he noted metronomic indications for just one piano sonata, the so-called 'Hammerklavier', published in 1819. What Beethoven omitted to do with his piano music, in particular his sonatas, attempted Carl Czerny, Ignaz Moscheles, Karl Holz, as well as Hans von Bülow, Alfredo Casella and Arthur Schnabel. Their metronome markings suggestions provide great insight into the composer's sense of tempo, although there is almost always a difference of lived

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experience between these musicians and the composer, and moreover it is not always clear whether these metronome marks represent just the author's impression of Beethoven's intentions. [11] And, since there is no reliable literature by either Beethoven himself or his contemporaries, it is certainly questionable the degree of composer's intended tempo flexibility. In any case, the works of Beethoven, provided with his metronome markings, are extremely valuable for conclusions.

A brief review of the researches of the past regarding Beethoven's tempo selection

Several researchers examined so far Beethoven's tempo preferences and his metronome indications applying different methods, objective or more intuitive. Yakov Gelfand's approach, [12] in particular, consists of dividing Beethoven's metronome marks into different categories and matching piano sonata movements to the works in these categories in order to figure for piano works the symphonies and quartets' metronomic equivalent, based on the comparisons between different compositions because of their similarity in form and genre. The summarized results of his analysis have been basically that a) by providing a composition with a tempo indication, Beethoven implies not a possible zone of tempo, but a quite definite speed of pulsation, and b) if it is not indicated by a metronome marking, the task of the performer is to find the composer's intention through the examination of the melodic content of the figuration, and the rhythmic and textural peculiarities of the work. A comparable methodology to Gelfand's study has been Rudolph Kolisch's research. [13] Kolisch, in practice, generally groups compositions with a similar range of note values, metre, and tempo indication together assigning them a particular range of speed. And, although later scholars would agree that these are indeed the parameters that determine Beethoven's speed, a closer examination of Kolisch's method reveals that it depends at least in part on his own musical preferences. Moreover, taking the metronome marks as starting point, Hermann Beck in his dissertation [14] argued that it was the *Bewegung* that determined the intended speed: a combination of the prevailing note values and patterns, the tempo indications, and the metre and its traditionally associated speed. Beck's methodology still relies to a certain degree on modern musical intuition in estimating the speeds for works without metronome marks, while William S. Newman's book [15] regarding Beethoven's tempo, despite of delivering a remarkable collection of evidence, nevertheless it could not be considered as a reliable source. George Barth's [16] study, examining an extensive use of rhetoric in modern performance, rejects the overreliance on Czerny proposals which leads to limitation of the expressive devices available to the modern performer. However, Barth reflects rather his own musical intuition and not necessarily Beethoven's, although he seems to be correct about Czerny's negative influence on the modern performer, and he intends mainly to suggest a certain modern performance style seeking more expressive tempo selection without the limitations of the old-style performance. And since Tilman Skowroneck's book, [17] a mixture of biography and description of Beethoven's playing style, covers many aspects that could influence the composer's performance style except tempo, Sandra Rosenblum examines much deeper the issue of tempo [18] coming up with three different ways to determine the supposed intended tempo when no metronome mark by the composer is available: either by consulting a metronome mark by Czerny or Moscheles, or by 'borrowing' a metronome mark from another work with similar characteristics, or by combining both ways. Therefore, Rosenblum's method despite of offering a general picture Beethoven's music performance during his lifetime, it does not constitute an accurate reflection of the composer's will, but at the same time comprises a representative exemplar of some performance practices of the first half of the nineteenth century. A much more detailed discussion of Beethoven's intended tempo has been provided in an article on the metronome marks for the symphonies and string quartets by Clive Brown, [19] who chose to focus on the metronome marks for fast movements of Beethoven's symphonies and string quartets, which are in the same metre and the same tempo indication, coming to the conclusion that a fast movement with shorter note values has ordinarily a slower speed than another one with longer note values. Charles Rosen's angle on the subject 'Beethoven's tempo' [20] combines in a rather balanced way the approach of the modern performer and of the early nineteenth-century musician highlighting the benefits of both

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traditions. Rosen attempts to 'determine a satisfactory range for the meaning of Beethoven's terms and avoid some absurdities', [21] examining cases of proportional tempos in Beethoven's piano sonatas such as the 2:1 tempo ratio between the opening Maestoso of the Piano Sonata op. 111 and the subsequent transition into the following Allegro con brio ed appassionato.

The evidence delivered by some of these researchers shows that Beethoven's intended tempos are determined by a combination of time signature, range of note values, and tempo indications, and that Beethoven probably remained consistent to these principles throughout his life. While most of the forementioned literature contains only partially certain aspects of Beethoven's tempo indications pointing out expressive devices to modern musicians, the thesis of Marten A. Noorduin *Beethoven's Tempo Indications* [22] goes one step further, matching the different indications concerning tempo with the parameter of expression, and discussing Beethoven's tempos from slow to fast. His method takes into account both Beethoven's own tempo indications in his compositions, metres, and ranges of note values, and his writings on performance practice, metronome marks, and other documents by his hand that probably reveal his intended tempi, as well as the metronome marks by Beethoven's contemporaries such as Czerny, Moscheles, and Holz shaping a comprehensive picture of this thorny issue. According to Noorduin, in Beethoven's works, certain indications are to be found which imply a particular expression. Specifically, four different indications are to be found which move at a speed comparable to adagio. Sostenuto, which moves parallel to adagio, often expresses generally pleasant feelings, and is also used as a modifier to adagio, presumably to indicate the same expression. Largo, on the other hand, moves at the same speed, but is much more severe and solemn, as are Maestoso and Grave, which move parallel to fast and slow adagio, respectively. Andante for the most part expresses pleasant feelings, but the term is also used as a means to indicate a speed comparable to walking or marching. Beethoven seems to have used the term allegretto in two different ways. On the one hand, it can have a speed slightly faster than andante, and an expression that is not dissimilar from it. On the other hand, it can also serve as an alternative to allegro, with a much faster speed and a large variety of possible kinds of expressions. Beethoven's sense of tempo is remarkably consistent in the sections that are marked Allegro, nevertheless not without exceptions. The best examples of this are Allegro con brio and Allegro vivace. Allegro con brio appears to be a little slower than Allegro vivace, which is almost as fast as Allegro molto.

Additionally, the relationship between the metronome marks by Carl Czerny, Ignaz Moscheles, and Karl Holz and Beethoven's intentions is certainly ambiguous, as it is not always clear whether these metronome marks represent the author's supposition of Beethoven's tempo intentions, or whether they express just their reflection on the ideal performance of the composer's music. Unquestionably, each one of them have been contemporary of Beethoven who worked or studied with him, heard him play his own works, and rehearsed his works under the composer's supervision. The collection of Karl Holz's metronome marks is probably the most straightforward, as it seems to originate from the rehearsals of these works during which both Beethoven and Holz were present, [23] while Moscheles's writing on Beethoven's music reflects his personal experiences having heard the composer performing on several occasions and consequently provides a specific idea of the intended tempos of some of Beethoven's compositions. Occasional instruction from Beethoven received Czerny, having become around the turn of the nineteenth century first Beethoven's pupil, and having studied several piano sonatas with him, but also having some kind of guidance from Beethoven later in life as well for more than two decades, a fact which makes his metronome marks comparably more important. [24] There are five different sets of metronome marks published under Czerny's name, although the degree of Czerny's full involvement in every one of them is doubtful. [25]

Definitely, tempo within a work was often intended to be flexible. However, it is difficult to be clarified which degree of flexibility Beethoven's tempos were intended to reach. Ignaz von Seyfried's description of Beethoven's approach to performances containing an 'effective rubato' [26] as well as Moscheles's comment that a certain amount of flexibility was a necessity in order to enhance music expression [27] suggest that -although there might have been practical problems

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with using too much flexibility in orchestral music- nevertheless too strict tempo without any fluctuations throughout the piece had never been Beethoven's intention. In any case, Richard Wagner seems to have been right, when he demonstrated that

'Obviously it is the character of the performance which determines the right tempo of a piece. The decisive factor is whether sustained tone or rhythmic motion should predominate. When he has made up his mind about this the conductor will know what kind of tempo to employ.' [28]

A new suggested approach of tempo in Beethoven piano sonatas

As far as Beethoven's piano music, and his piano sonatas, in particular, concerns, having these forementioned references and conclusions in mind, it is sometimes apparent, sometimes implied that a certain metronomic connection exists – more or less conscious – between the different movements of a sonata and additionally within the same movement, in cases where the composer uses alternately more than one single tempo indication. The equivalences refer to the pulsation of each movement's main time unit. As a result, time ratios emerge that strengthen the sonata's cohesion and its movements interaction. In the current study, we focus specifically on twelve of Beethoven's sonatas which feature one or both of following attributes: a) either they include movements with different but proportional tempo indications within, or b) at least two of the sonata's movements are played consecutively without interval, namely "attacca". Certainly, tempo analogies could be found more or less in each one of the rest twenty sonatas, however, the proportional way of conceiving tempo becomes more evident in the sonatas including the forementioned two attributes. Notwithstanding, at this point it is necessary to clarify that the various note values proportions and time units ratios detected and presented in the upcoming examples are personal interpretative suggestions supported by valid arguments and do not capture necessarily Beethoven's tempo intentions rather they underline an analogical way of compositional thinking tempo-wise revealing the compositions' coherence as each sonata is considered as a whole and its movements as connected parts of a comprehensive art work.

The case of '*Hammerklavier*'

The highly demanding Sonata op. 106, (*Hammerklavier*), is the only piano sonata, where Beethoven himself chose to note metronome markings. The time pulse relations that could be detected in this masterpiece reveal significant conclusions regarding the existence or non-existence of tempo proportions in Beethoven's sonatas. [29] The first movement of the masterwork in *Allegro* indication and 4/4 *alla breve* metre features as metronome mark: half note equal 138, therefore a quarter note equals 276. In the second movement in *Assai Vivace* and 3/4 time signature, the metronome mark is 80 for a dotted half note, i.e. 240 for a quarter note. Consequently, the quarter note as time unit is slightly faster in first movement than in the second one. Next, Beethoven notes in the third movement in *Adagio sostenuto* and 6/8 metre the mark 92 for an eighth note, namely 46 for a quarter note. Compared to opening movement's quarter note, time pulse becomes six times slower, while in fourth movement's fugue in *Allegro risoluto* and 3/4 metre the pulse is almost half of the first movement's pulse, as the fugue's quarter note is marked to be played in 144 in relation to first movement's 138 metronome mark, but for a half note. On the other hand, the relation between third movement's *Adagio* and final movement's opening *Largo* in 4/4 meter, namely between 92 marking for eighth note and 76 for sixteenth note, respectively, makes *Adagio*'s eighth note a little faster than *Largo*'s sixteenth note. Finally, comparing fourth movement's *Largo* to same movement's fugue in *Allegro* indication, we come to the result that *Largo*'s sixteenth note is almost equal to *Allegro*'s half note, as fugue's 144 for a quarter note equals 72 for a half note and *Largo* begins in 76 for a sixteenth note. Therefore:

Table 1. According to Beethoven's metronome indications

Piano Sonata	Movements' relation	Ratios of note values

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No. 29 Op. 106

*	1. mov. Allegro to 2. mov. Assai Vivace	♩ ≤ ♩ [30]
*	1. mov. Allegro to 3. mov. Adagio	6♩ = ♩
*	1. mov. Allegro to 4. mov. Allegro (Fugue)	𝅗𝅥 ≥ ♩ [31]
*	3. mov. Adagio to 4. mov. Largo	♪ < 𝅘𝅥𝅯
*	4. mov. Largo to 4. mov. Allegro (Fugue)	𝅘𝅥𝅯 ≤ 𝅗𝅥

Conclusively, studying '*Hammerklavier'* metronome-wise, we deduce that Beethoven himself applies time pulse proportions, sometimes accurately and at times approximately. Certainly, having just one sonata with metronome markings by the composer himself could not be necessarily considered as sufficient evidence for safe conclusions, nevertheless Beethoven's tendency to time proportions is more or less to be seen and could definitely serve as exemplary guidance for the performers of new age.

Music examples of tempo proportions and time units' ratios

The first piano sonata to be examined -including one or both of the preassigned attributes above- is the Sonata Op. 13, the so-called '*Pathetique'*. In its opening movement exist two different tempo indications (*Grave* and *Allegro molto e con brio*). In the introduction in *Grave* as well as in the two following Grave sections -in the middle of the movement, before the development (mm. 133-136), and just before the coda (mm.295-298)- the eighth note in 4/4 metre is equal to a whole note, which is actually a whole bar *in alla breve* in the movement's main section in *Allegro molto*, composed in sonata form. The eighth note from the *Grave* becomes an eighth note in 2/4 metre in the next movement in *Adagio cantabile*, while the *Allegro*'s whole bar from the initial movement in the third movement in *Allegro* indication is equivalent to a half note (or half a bar) also in 4/4 *alla breve* metre.

The next examples to be presented include the two sonatas from Op. 27, '*quasi una Fantasia'*. The first sonata whose movements are performed each other without interruption (attacca), likewise '*Pathetique'*, contains two different indications in its opening movement, which alternate**,** *Andante* and *Allegro*, and features proportional relation between them. The half note in 4/4 *alla breve* metre of *Adagio*, that means half a bar, transforms to a whole bar in 6/8 time signature in the *Allegro* section, and the latter becomes two whole bars in the next movement in *Allegro molto e vivace* indication and 3/4 metre. Subsequently, the initial half note of the sonata's first movement is equal to the eighth note in 3/4 metre of the third movement in *Adagio con espressione* as well as equivalent to a whole bar in 2/4 metre in the ending fourth movement in *Allegro vivace*.

The other Sonata *quasi una fantasia* from Op. 27, the so-called '*Moonlight'* Sonata, consists of three movements which also feature equivalences among them. The quarter note as time unit in the sonata's popular opening *Adagio sostenuto* in 4/4 metre becomes a whole bar in 3/4 metre in second movement's *Allegretto* which quite often is played incorrectly too fast. The same time unit of a quarter note in the opening *Adagio* becomes half a bar in 4/4 metre in the last virtuosic movement in *Presto agitato*, as it is twice as fast. Going towards the end of the *Presto*, two bars in *Adagio* indication are inserted in between after a short *cadenza* (mm. 188-189) which are twice slower than the main tempo of the sonata's final movement.

The next interesting piano sonata to be commented is the seventeenth, Op. 31 Nr. 2 ('*Storm'*). The initial movement alternates *Largo* and *Allegro* in 4/4 *alla breve* metre, where *Largo*'s quarter note transforms into a whole bar in *Allegro*, namely the tempo becomes four times faster. *Largo*'s time pulse could be maintained also for the second movement's *Adagio* in 3/4 metre. Analogically, one whole bar of first movement's *Allegro* is proportional to a whole bar in third movement's *Allegretto* in 3/8 time signature.

The next time ratios regard the most popular sonatas of Beethoven's middle period, where time measure connections are also to be found among all movements of these compositions, of

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whom some of them are supposed to be played *attacca*. First, in the Sonata op. 53, the '*Waldstein'*, a whole note in 4/4 time signature in the opening movement, a whole bar in other words, is equivalent, on the one hand, to an eighth note in 6/8 metre in the following slow movement in *Adagio molto*, on the other hand to a whole bar in 2/4 metre in the *Allegretto moderato* of the third movement. Within the last movement, *Allegretto* turns to *Prestissimo* in the final section of the work and the previous whole bar beat becomes twice as fast, namely two whole bars in 4/4 *alla breve*. Certainly, this tempo proportion is quite ambitious as it demands great technical ability from the performer, however, it serves faithfully the composer's challenging indication *Prestissimo*.

Equivalent time pulse proportions includes the Op. 57 '*Appassionata*'. Considering the dotted half note in 12/8 time signature in the opening movement (*Allegro assai*) as essential time unit, we mark that it equals the eighth value in the short *Adagio* (m. 238), just before the movement's final *Coda*. Moreover, in relation to the following movement in *Andante con moto***,** the same basic time pulse of first movement's *Allegro* equals a quarter note in 2/4 metre, as well as a whole bar in 2/4 time signature in the ending movement's *Allegro*. Simultaneously, the quarter note of the second movement, which leads *attacca* to the third and final movement becomes double, namely a half note. Similar to *Waldstein*'s last movement, there is a tempo change also within this movement from *Allegro* to *Presto*, where the half note or whole bar of *Allegro* could be played twice as fast in the ending *Presto*, namely in this case would be redoubled to two whole bars. As it was noticed for the respective point of *Waldstein*, it would be technically extremely demanding to be reached the perfect proportion between the two different speeds of the final movement of '*Appassionata*'.

The short Sonata Op. 78 in two movements includes in its opening movement a four-bar introduction in *Adagio cantabile* before the main section in *Allegro ma non troppo*. The proportion between these two tempo indications refers to the quarter note in 2/4 metre of *Adagio* that later on equals a whole bar in 4/4 time signature in *Allegro*. The time pulse of a whole bar equals two bars in the second movement's *Allegro vivace* in 2/4 metre.

Likewise previous sonatas that have been examined, also Sonata Op. 81a, the so-called '*Les adieux*', includes both different tempo indications within the same movement as well as *attacca* connection between the second and the third movement of the composition. In the initial movement, the eighth note of the opening *Adagio* in 2/4 metre equals a whole bar in *Allegro*'s 4/4 *alla breve* as well as, respectively, an eighth note in *Andante espressivo* of the next movement which transforms to a whole bar in *Vivacissimamente* in 6/8 time signature in the final movement**.** The inserted *Poco Andante* in the same time signature, short before the end of the last movement (mm. 176-190), is twice as slow, as the whole bar pulse becomes the equivalent pulse of half a bar.

Particular interest feature the last five piano sonatas which belong to Beethoven's last composing phase defined by great mastery and maturity. First, in the Sonata Op. 101**,** a whole bar in 6/8 time signature from opening movement's *Allegretto ma non troppo* as time unit functions as the equivalent of one bar, as well, in second movement's *Vivace alla Marcia* in 4/4 metre, as half a bar in third movement's *Adagio ma non troppo* in 2/4 metre, and finally as two whole bars in ending movement's *Allegro* in 2/4 time signature, while the two last movements are supposed to be performed *attacca* shaping a time ratio 1:4.

Next, the Sonata Op. 109 comprises an excellent exemplar of tempo analogies in Beethoven's piano music. In the initial movement in *Vivace ma non troppo*, the quarter note in 2/4 time signature equals a sixteenth note in 3/4 metre in the upcoming *Adagio espressivo* as well as a whole bar in 6/8 metre in *Prestissimo* of the subsequent second movement, while the same time pulse equals an eighth note in 3/4 metre in the final third movement in *Andante molto cantabile ed espressivo* indication, being in theme and variations music form. Respective proportions are to be found also within the lyrical third movement among the theme and its variations. The theme's time unit of a quarter is being maintained in variation I and variation II, while in variation III (in *Allegro vivace*) equals a whole bar in 2/4 time signature. In variation IV, the initial quarter note of the theme is equivalent to a dotted quarter in 9/8 metre, but according to the composer's writing **'***un poco piu adagio*' in relation to the theme. The theme's time unit of a quarter becomes a whole bar in 4/4 metre *alla breve* in the following variation V in *Allegro ma non troppo* tempo indication. The

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reintroduction of the theme in the final variation VI leads to a gradual diminution of rhythmic values, where the initial thematic quarter notes (mm. 153-156), first becoming dotted quarter notes in 9/8 metre (mm. 157-160), subsequently transform to eighth notes in triple metre (mm. 161-164), and then eighth note triplets (mm. 164-168), while the accompany of the theme's variation, starting from quarter note (mm. 153-154), develops serially to eighth notes (mm. 155-156), eighth note triplets (mm. 157), sixteenth notes (mm. 158-160), thirty-second notes (mm. 160-164), and finally to a trill (mm. 164-168).

In the penultimate Beethoven's Sonata Op. 110**,** the first movement's time unit of a quarter note in 3/4 metre and *Moderato cantabile* tempo indication equals two whole bars in 2/4 time signature in the subsequent movement's *Allegro molto*, while in *Adagio ma non troppo* of the third movement is equivalent to an eighth note in 4/4 metre. In the forementioned sonata's final movement, *Adagio*'s eighth note equals a dotted eighth note in the following 12/16 metre (m. 7), which is equivalent to a whole bar in 6/8 metre in the subsequent fugue in *Allegro ma non troppo* indication (m. 27) shaping a ratio 1:4. Moreover, the transition from the fugue to *Meno allegro* (mm. 168-174) reduces the music's speed by the half, in other words a dotted half note becomes a dotted quarter note in 6/8 metre.

The last Sonata Op. 111 consists of two movements that also demonstrate equivalences of temporal pulse. In the opening *Maestoso* of the first movement, having the character of a *Grave*, the quarter note in 4/4 metre becomes initially a half note in the subsequent *Allegro con brio*, [32] and next, a dotted eighth note in 9/16 time signature in the second movement's *Adagio molto*. *Arioso*, a theme and variation form, likewise the former last movement of Op. 109, maintains the same time pulse during the whole process of the variations, as the initial dotted eighth note in 9/16 metre equals successively an eighth note in 6/16 metre (m. 32) as well as an eighth note in 12/32 metre (m. 48).

If the dominating note values which serve as main time units for each movement and each sonata are converted to whole bars, then the ratios of bars between the movements of the sonatas featuring different tempo indications and diverse time signatures would be as following:

Table 2.

Piano Sonata	Movements' relation	Ratios of bars
No. 8, Op. 13	*	*
*	1. mov. Grave to 1. mov. Allegro molto	1:8
*	1. mov. Grave to 2. mov. Adagio	1:2
*	1. mov. Allegro molto to 2. mov. Adagio	4:1
*	1. mov. Allegro molto to 3. mov. Allegro	2:1
No. 13, Op. 27 No. 1	*	*
*	1. mov. Andante to 1. mov. Allegro	1:2
*	1. mov. Allegro to 2. mov. Allegro molto	1:2
*	1. mov. Andante to 3. mov. Adagio	3:1
*	1. mov. Andante to 4. mov. Allegro vivace	1:2
*	2. mov. Allegro molto to 4. mov. Allegro vivace	2:1
*	3. mov. Adagio to 4. mov. Allegro vivace	1:6
No. 14, Op. 27 No. 2	*	*
*	1. mov. Adagio to 2. mov. Allegretto	1:4
*	1. mov. Adagio to 3. mov. Presto	1:2
*	3. mov. Presto to 3.mov. Adagio	2:1
No. 17, Op. 31 No. 2	*	*
*	1. mov. Largo to 1. mov. Allegro	1:4
*	1. mov. Largo to 2. mov. Adagio	3/4:1

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*	1. mov. Allegro to 3. mov. Allegretto	1:1
No. 21, Op. 53	*	*
*	1. mov. Allegro to 2. mov. Adagio molto	6:1
*	1. mov. Allegro to 3. mov. Allegretto moderato	1:1
*	2. mov. Adagio molto to 3. mov. Allegretto	1:6
*	3. mov. Allegretto to 3. mov. Prestissimo	1:2
No. 23, Op. 57	*	*
*	1. mov. Allegro assai to 1. mov. Adagio	6:1
*	1. mov. Allegro to 2. mov. Andante con moto	1:1
*	1. mov. Allegro to 3. mov. Allegro ma non troppo	1:2
*	2. mov. Andante to 3. mov. Allegro	1:2
*	3. mov. Allegro to 3. mov. Presto	1:2
No. 24, Op. 78	*	*
*	1. mov. Adagio to 1. mov. Allegro ma non troppo	1:2
*	1. mov. Allegro to 2. mov. Allegro vivace	1:2
No. 26, Op. 81a	*	*
*	1. mov. Adagio to 1. mov. Allegro	1:4
*	1. mov. Adagio to 2. mov. Andante	1:1
*	1. mov. Allegro to 2. mov. Andante	4:1
*	1. mov. Allegro to 3. mov. Vivacissimamente	1:1
*	2. mov. Andante to 3 mov. Vivacissimamente	1:4
*	3. mov. Vivacissimamente to 3. mov. Andante	2:1
No. 28, Op. 101	*	*
*	1. mov. Allegretto ma non troppo to 2. mov. Vivace	1:1
*	1. mov. Allegretto ma non troppo to 3. mov. Adagio ma non troppo	2:1
*	1. mov. Allegretto ma non troppo to 4. mov. Allegro	1:2
No. 30, Op. 109	*	*
*	1. mov. Vivace ma non troppo to 1. mov. Adagio	6:1
*	1. mov. Vivace to 2. mov. Prestissimo	1:2
*	1. mov. Vivace to 3. mov. Andante	3:1
*	3. mov. Theme to 3. mov. Var. I	1:1
*	3. mov. Theme to 3. mov. Var. II	1:1
*	3. mov. Theme to 3. mov. Var. III	1:3
*	3. mov. Theme to 3. mov. Var. IV	1:1 [33]
*	3. mov. Theme to 3. mov. Var. V	1:3
*	3. mov. Theme to 3. mov. Var. VI	1:1
*	3. mov. Var. VI (3/4) to 3. mov. Var. VI (9/8)	1:1
No. 31, Op. 110	*	*
*	1. mov. Moderato to 2. mov. Allegro molto	1:6
*	1. mov. Moderato to 3. mov. Adagio ma non troppo	1:3/8
*	3. mov. Adagio (4/4) to 3. mov. Adagio (12/16)	1:2
*	3. mov. Adagio (4/4) to 3. mov. Allegro ma non troppo (Fugue)	1:8

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*	3. mov. Adagio (12/16) to 3. mov. Allegro ma non troppo (Fugue)	1:4
*	3. mov. Adagio (4/4) to 3. mov. Meno Allegro	1:4
*	3. mov. Allegro ma non troppo (Fugue) to 3. mov. Meno Allegro	2:1
No. 32 Op. 111	*	*
*	1. mov. Maestoso to 1. mov. Allegro	1:2
*	1. mov. Maestoso to 2. mov. Adagio	3/4:1
*	2. mov. Theme (9/16) to 2. Mov. 6/16	1:1
*	2. mov. Theme (9/16) to 2. Mov. 12/32	1:1

Conclusion

After having appointed as starting point the fact, on the one hand, that Beethoven in his symphonies and quartets seems to be quite flexible with his own metronome markings for similar tempo indications considering the composition's character as the most essential element for the definition of the ideal speed, on the other hand taking into consideration the composer's own metronome indications in '*Hammerklavier*', where accurate or approximate tempo ratios become clear, a potential suggestion to prefer exact or much the same proportional speeds concerning the time pulsation among the movements of the majority of his piano sonatas -especially in those which feature apparent the *attacca* characteristic- sounds pretty practical, legit and coherent, forming an interpretative approach that could easily function as a rather safe guide for the aspiring performer of these masterworks.

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30. With the symbol ≤ is meant that the first quarter note is slightly faster than the second one.
31. Meaning than the half note is almost equal to the quarter note.
32. An observation that has been mentioned also by Charles Rosen (see above).
33. Actually, not exactly proportional, as Beethoven's indication is 'un poco piu adagio del Tema'.

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